2-18-2016

Environmental Literacy Assessment: Assessing the Strength of an Environmental Education Program (EcoSchools) in Ontario Secondary Schools for Environmental Literacy Acquisition

Blessing Adaku Igbokwe
University of Windsor

Environmental Literacy Assessment: Assessing the Strength of an Environmental Education Program (EcoSchools) in Ontario Secondary Schools for Environmental Literacy Acquisition

By

Blessing Igbokwe

A Dissertation

Submitted to the Faculty of Graduate Studies

through the Faculty of Education

in Partial Fulfillment of the Requirements

for the Degree of Doctor of Philosophy

at the University of Windsor

Windsor, Ontario, Canada

2016

Environmental Literacy Assessment: Assessing the Strength of an Environmental Education Program (EcoSchools) in Ontario Secondary Schools for Environmental Literacy Acquisition

by

Blessing Igbokwe

APPROVED BY:

_____
P. Elliott, External Examiner
Trent University

_____
C. Lakhan, External
Department of Earth and Environmental Sciences

_____
C. Beckford
Faculty of Education, University of Windsor

_____
J. Engemann
Faculty of Education, Brock University

_____
Dr. Geri Salinitri, Advisor
Faculty of Education, University of Windsor

February 8, 2016

DECLARATION OF PREVIOUS PUBLICATION

This dissertation includes part of an original paper that has been previously published as a journal article in a peer reviewed journal, as follows:

Dissertation Chapter	Publication Title/Full Citation	Publication Status
Introduction (chapter 1) and literature review (chapter 2)	Igbokwe, B.A. (2011). Environmental literacy assessment: Exploring the potential for the assessment of environmental education/programs in Ontario schools. *International Journal for Cross-Disciplinary Subjects in Education*, *3*(1), 648-656.	Published

I certify that I have obtained a written permission from the copyright owner(s) to include the above published material(s) in my dissertation. I certify that the above material describes work completed during my registration as a graduate student at the University of Windsor.

I declare that, to the best of my knowledge, my dissertation does not infringe upon anyone's copyright nor violate any proprietary rights and that any ideas, techniques, quotations, or any other material from the work of other people included in my dissertation, published or otherwise, are fully acknowledged in accordance with the standard referencing practices. Furthermore, to the extent that I have included copyrighted material that surpasses the bounds of fair dealing within the meaning of the Canada Copyright Act, I certify that I have obtained a written permission from the copyright owner(s) to include such material(s) in my dissertation.

I declare that this is a true copy of my dissertation, including any final revisions, as approved by my dissertation committee and the Graduate Studies office, and that this dissertation has not been submitted for a higher degree to any other University or Institution.

ABSTRACT

Environmental literacy (EL) is an outcome of environmental education (EE) programs when structured to initiate learning in students. The EcoSchools program is a leading EE program in Ontario. Designed as a certification program for schools and students in K-12, it helps the school communities develop EL and practices to become responsible citizens and reduce the environmental footprint of schools. Currently, EL among students is not something that is assessed in Ontario schools yet the EcoSchools program has been adopted by most to the schools boards as a means of developing EL among students. It is not clear whether the EcoSchools result to EL among students. In this research, the Middle School Environmental Literacy Survey (MSELS), the EcoSchools Questionnaire and EcoSchools Teacher Co-ordinator Questionnaire were used to assess students' EL, awareness levels, source of environmental knowledge, the visibility of the EcoSchools program, and finally, the EcoSchools teacher co-ordinator's perception of the program in the participating school board. The EL results were compared among students in Eco and non-EcoSchools. Result from the research showed that in the study area EL was generally low. Only 29.3% of the students were deemed as having met the provincial standard of level 3 (70% or higher) in the EL scores. Other findings included; students' main source of environmental knowledge and the EcoSchools teacher co-ordinators' perception of the program. Although students main source of environmental knowledge was not from the EcoSchools program, some of the teachers interviewed believed that the EcoSchools program has created a significant level of environmental awareness within the school community and with a few modifications, such as providing more time for the teachers to plan and implement the program, the EcoSchools would be capable of being an outstanding EE programs that promoted EL, awareness and students participation in environmental matters.

DEDICATION

To my husband, Sam Igbokwe for his love and support, for being a major player in God's redemptive miracle in my life, for letting me draw on his strength when I had nothing left, you, honey, are my "Dimkpa N'asa". To Victor, Emmanuel, Tim and The Lioness Princess Victoria, for being my inspiration and joy and for letting me pursue this path for the past six long years. You all inspire me to be the best.

ACKNOWLEDGEMENTS

The completion of this research was possible as a result of contributions and support from several individuals and organisations. First, I want to thank my supervisor, Dr. Salinitri for taking up the task of mentoring and encouraging me through the ups and downs of my PhD journey. You took me when I could see no way ahead; I am grateful for your support, kind words, endless editing and suggestions that helped shape the final product. Words cannot even begin to express my appreciation for your understanding and kindness; nevertheless, I'd want to let you know that you rock!

I particularly want to thank Dr. Clinton Beckford my co-supervisor for encouraging; starting this journey with me; and helping me weather the storms at various stages of my study. Your selflessness and concern for my success meant the world to me. I am so thankful that we completed it together.

I am also grateful to my academic committee member—Dr. Joe Engemann and my external program reader —Dr. Chris Lakhan for their suggestions, time and input throughout the course of my dissertation. My gratitude also goes to my external examiner, Dr. Paul Elliott for his time and patience as he examined and critiqued my work.

I also want to thank Dr. George Zhou for his support and commitment through the dissertation proposal phase, Dr. Allen Andrew for helping me kick-start my data collection, Dr. Darren Stanley for his advice and help as I prepared for my portfolio defence, Dr. Karen Roland, for always giving me a listening ear whenever I was down and confused.

My appreciation also goes to the Ontario Secondary School Teacher Federation (OSSTF) for supporting and providing me with partial funding for this research through the Brick Robb Memorial Scholarship (2012).

To all my colleagues, I say thank you for checking up on me and encouraging me to go on, especially Louise Gonsalvez who never failed to send me reminders and e-mails to check on my progress, commitment to completing my dissertation and words of encouragement.

Also, great thanks to my teacher-colleagues who rose to the occasion when I needed help, offered me such warm support and advice without any inhibitions, and also took time to read through my work. To all of you, I say, your professionalism was outstanding, and your selfless help and encouragement made this journey so much smoother than I anticipated. I may not be able to mention your names, but the parts you all played are forever engraved in my heart.

I also want to acknowledge Dr. Trudi Volk, the Executive Director, Center for Instruction, Staff Development and Evaluation, Carbondale Illinois for granting me the permission to use the MSELS for my research and for her patience and advice during all our communications. In the same vein, I want to thank the Infonomics Society, publishers of the International Journal for Cross-Disciplinary Subjects in Education (IJCDSE) for giving me the permission to use material from my published work as part of my final dissertation.

My thanks also go to my incredibly handsome sons, Victor, Emmanuel and Timothy Igbokwe who served as my part-time grammar editor and data entry clerks; to Sam Igbokwe, for the time he took to proofread several sections of my huge tome; and to my baby, the exquisite Lioness Princess Victoria (Torie), for keeping me grounded.

Similarly, I say thank you to Julie, Kim, Lorraine, Sola, Sudine, Victoria and the Girl Time ladies! You all make me feel so special beyond words and I appreciate your support, strength and prayers as I ran towards the finish line.

Finally, I acknowledge the University of Windsor, especially the Faculty of Education and graduate studies for providing me with scholarships and funds to attend multiple international and national academic conferences. Your support made my experience richer and my education deeper.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

CHAPTER 2

LITERATURE REVIEW

CHAPTER 3

RESEARCH METHODOLOGY

CHAPTER 4

PRESENTATION AND ANALYSIS OF DESCRIPTIVE QUANTITATIVE DATA

CHAPTER 5

INFERENTIAL DATA ANALYSIS

CHAPTER 6

ANALYSIS AND PRESENTATION OF QUALITATIVE DATA

Part I: School Walk-Around Analysis

PART II: ANALYSIS AND PRESENTATION OF ECOSCHOOLS' TEACHER CO-ORDINATORS INTERVIEW

PART III: ANALYSIS AND PRESNTATION OF ECOSCHOOLS' PROGRAM CO-ORDINATOR AND PRINCIPALS INTERVIEWS

School Principal's Interview

CHAPTER 7

DISCUSSION AND CONCLUSIONS

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF ABBREVIATIONS

EE – Environmental education

EL – Environmental literacy

CHAPTER 1

INTRODUCTION

Statement of Problem

Since the early 2000s, there has been a significant increase in the implementation of environmental education (EE) programs[1] (e.g., the EcoSchools and EarthCARE™[2] programs) in Ontario schools for teaching EE and fostering environmental literacy (EL) in school children (Hastings & Prince Edward District School Boards. 2010; Ontario EcoSchools, 2010; Ottawa-Carlton District Board, 2010). The proliferation of the use of EE programs and initiatives[3] in schools resulted from the incessant call for the prioritisation of EE in schools (Lin, 2002; Puk, & Behm, 2003; Report of the Working Group on Environmental Education, 2007) and an effort by the ministry to infuse EE into the public school curriculum.

The EcoSchools program has been embraced by several school boards in Ontario. Statistics from the EcoSchools program website (http://www.ontarioecoschools.org/) indicated that there are currently over 1,000 schools in about 52 different school boards (about two third) across Ontario participating in the EcoSchools program for promoting

[1] A program is a set of specific activities designed for an intended purpose with quantifiable goals and objective (Lodico, Spaulding & Voegtle, 2006). Hence, any reference to EE program or initiative will connote a set of EE specific activities designed for EE in order to achieve literacy (part of its purpose) with quantifiable goals and objectives.

[2] The EarthCARE™ program, similar to the EcoSchools programs is also a school wide EE programs in Ontario that offer curriculum-compliant resources and activity-based learning focused on EE. The major focus of the EarthCARE™ program is school wide energy reduction and environmental action (EarthCARE, 2009).

[3] EE initiatives and programs will refer to all proposals, plans, projects, unique teaching processes, or an act or statement designed to address environmental concern or issue, or projects adopted to assist in educating students on environmental matters and fostering EL. Two major initiatives often referred to in this proposal are the EcoSchools and the EarthCARE™ programs.

ecological literacy, energy conservation, wasted minimisation and school yard greening among schools and students (Ontario EcoSchools, 2016).

While the use of these EE programs in Ontario is on the rise in elementary and secondary schools, some scholars have argued that programs such as the EcoSchools, designed to be infused with other school subjects, may not really be effective for fostering and achieving the necessary EL in students (Puk & Behm, 2003). Puk and Behm's arguments against the format of delivery of EE programs (integrated approach) are that infusion may lack the "sequential order for developing ecological literacy[4] within individual courses and from grade to grade" and become "thinly spread out into other subjects" thereby causing EE to lose its unique identity. This form of implementation, critiqued Puk and Behm, "translates into unfocussed curriculum and the unfulfilled establishment of knowledge base" (p. 227).

Furthermore, they argued that the infusion model of EE is not working for Ontario secondary schools as indicated by the finding from their investigation that the infusion method "rather than strengthening environmental science, has had the opposite effect and has led to the dilution of ecological literacy in the Ontario curriculum" (p. 226).

In contrast, the EcoSchools[5] and EarthCARE™ programs claimed that these EE initiatives, developed to be infused with the Ontario curriculum, have generally been very successful in involving students and improving environmental practices and behaviour in students. This claim was evident in former Minister of Education, Kathleen Wynne's statement in 2009. While praising and expressing her pride in the efforts made by EE

[4] Ecological literacy in this dissertation is used interchangeably with environmental literacy.
[5] The EcoSchools program is an EE program in Ontario for grades 1-12. Developed in 2002 as a whole-school approach to EE, it aims at helping students develop ecological literacy while engaging in practices that help them become environmentally responsible citizens. The EcoSchools program also helps improve school building operations to reduce environmental impacts and overall energy consumption.

programs in supporting EL across Ontario schools, she also stated that it was a common knowledge that children were already leaders in caring for the earth (Ontario Ministry of Education's News Release, February 2009).

Also echoing the same feeling on the success of the EcoSchools program are several schools and school boards in Ontario that have embraced the EcoSchools initiatives. Many offered accolades/awards for the EcoSchools' effectiveness in improving students' overall learning, EL and schools' physical environment (Ontario EcoSchools, 2010).

The increase in schools' participation with students' and school wide activities taking centre stage has also been highlighted by the news media. For example, headlines like, 'Eco-clubs make the grade with Green' (Firth, 2010), 'Halton's EcoSchools program thriving: Environmental program has grown from four to 99 schools since 2006' (Smith, 2010), 'Power Savings at Catholic School Board' (Pringle, 2010), 'North Durham schools are eco-excellent' (Morgan, 2010), 'Arthur Public School earns gold for going green' (Clark, 2010) are just a few examples of success stories that have been carried by the news media and further serve as a stamp of approval often used by the EcoSchools program initiators to corroborate claims of program effectiveness.

These headlines may suggest that the focus is mainly on school participation, which in itself is desirable, but effective EE goes beyond participation. It should include all aspects of EE and features of effective EE as highlighted in the Ontario Ministry of Education (n.d.) standards for EE. For example, EE should also provide "opportunities for learners to become environmentally literate; … apply their acquired knowledge, perspectives, skills, and practices in real world situations; and … become

environmentally responsible citizens who are aware of the global implications of local action" (p. X).

Fawcett (2009) noted that "evaluation of programmes" in EE "is minimal" (p. 105). This may often result to relying on acclaims by the program's creator or the statements of participating schools in judging the effectiveness of these EE programs. In addition, there is limited academic evidence documenting the effectiveness of these major EE programs (such as the EcoSchools) in fostering EL or change in the level of students' EL as a result of their participation in these programs.

One of the major goals of EE programs is the development of EL in students (Culen, 2005; Disinger, 2005; Hsu, 2004; McBeth & Volk, 2010; NAAEE, 2004; Orr, 1990; Report of the Working Group on Environmental Education, 2007; Stapp et al, 2005; UNESCO-UNEP, 1983). The overarching question is whether the programs are enhancing EL acquisition.

While the efforts and claims made by the EcoSchools proponents are positive and commendable for EE, they may also constitute self-aggrandisement, as these statements are mostly unverified by any independent academic research. In Ontario, there is limited research evidence on whether or not EE programs are fostering EL in students. Furthermore, a quantifiable aggregate effect of these programs on students' EL has not been documented despite the fact that one of the major goals of the EcoSchools program is the development of ecological literacy among K-12 students.

In light of this, there is need for EL assessment and documentation of the effectiveness of major EE programs (like EcoSchools and EarthCARE^{TM}) in terms of their claims as being effective in improving students' EL.

Purpose of Study

The main purpose of this research is to assess the impact of EcoSchools program on students' EL in secondary schools. To this end, the study investigated the level of students EL, their involvement in the EcoSchools program and the importance of the EcoSchools program as a main source of environmental knowledge for the students.

Also, the visibility of EE programs plays a role in creating general environmental awareness among students. Researchers claim that obvious green facilities benefit students by enriching their environmental knowledge and learning about sustainability through *osmosis* (Higgs & McMillan, 2006). Where you have lots of environmental activities going on within the school community and posters and other prompts encouraging positive environmental behaviour, the awareness level is expected to be heightened among students within the school; therefore, I analysed the level of students' awareness of the visibility of the EcoSchools program in schools.

Finally, the participating EcoSchools teacher co-ordinators perspectives on the success of the program were also important to this study since they were in direct contact, observed, collected data, reported on and championed the EcoSchools program in their schools. Consequently, I explored the EcoSchools teachers' perspective of the EcoSchools program (what they did, what was great, and what needed to change) in order for the program to further progress.

Research Questions

The main guiding questions for this research are:

1. What is the EL level of students in the surveyed school board (using Roth's EL continuum and Ontario grading levels)?

2. Do students in schools with EcoSchools program demonstrate a higher level of EL compared to students in schools without EcoSchools program?
3. Do students in schools (with gold, silver or no level of EcoSchools certification) display different levels of EL?
4. Do students in county schools and students in city schools display different levels of EL?
5. Do students' EL scores vary across grade (7 to 12)?
6. How aware of the EcoSchools program are students in the schools with the EcoSchools program?
7. Does students' level of awareness (of the EcoSchools program) vary with the level of their school's EcoSchools' certification (gold, silver or no certification)?
8. How do students rank the EcoSchools program as a source of environmental knowledge?
9. How do the EcoSchools teacher co-ordinators perceive the program (what they do, what is great, and what needed to change)?

Hypotheses

The following hypotheses have been formulated to help proffer statistical answers to some of the above research questions. The hypotheses are stated below in the null.

1. Majority of the students surveyed (51%) will not score a level 3 or higher in the EL assessment.
2. There is no significant difference in EL scores of students in EcoSchools and non-EcoSchools.

3. There is no significant difference in EL scores of students in gold, silver and non-EcoSchools (schools with no EcoSchools' certification).
4. There is no significant difference in EL scores of students in county and those in city schools.
5. There is no significant difference in EL scores of students in different grade levels.
6. Majority of students in EcoSchools (51% or higher) are not significantly aware (level 3 or higher) of their schools as part of the EcoSchools program.
7. There is no significant difference in students' level of awareness of the EcoSchools program in schools with different levels of certification.
8. The EcoSchools program is not ranked by students as the main source of environmental knowledge.

Significance of Study

The availability of limited studies and baseline reference on students' EL for K-12 in Ontario make it difficult to state with confidence the degree of impact the EE programs are having in terms of improving students' EL. In light of the absence of data on K-12 environmental literacy in Ontario, this research will provide a baseline reference on Ontario students' EL, benefit EE program designers by providing them insights on what is needed to enhance EE program for effective EL acquisition among students.

Justification for the study

Assessment of outcomes of EE efforts in terms of students' achievement is an issue that is of paramount importance in EE (Report of the Working Group on Environmental Education, 2007). EL, considered a major outcome of EE, is a fundamental goal of EE (Cullen, 2005; Disinger, 2005; Cutter-Mackenzie & Smith, 2003; Hsu, 2004; McBeth &Volk, 2010; Orr, 1990; Report of the Working Group on Environmental Education, 2007; Stapp et al, 2005; UNESCO-UNEP, 1983). Students are expected to "acquire knowledge, skills, and perspectives that foster understanding of their fundamental connections to each other, to the world around them, and to all living things" (Ontario Ministry of Education, 2009, p. 11). To further highlight the place of EL assessment in EE, the Tbilisi declaration called for the assessment of content, literacy and programs in EE "in order to encourage and improve them and to extend them to other educational institutions and programmes" (UNESCO-UNEP, 1983, p. 21).

Assessing EL can provide information for the field of EE in Ontario to "evaluate its progress and make decisions related to [its] future direction" (Volk & McBeth, 2005, p. 73) or make adjustment and/or any needed improvement in any EE programs. Other studies have also reiterated the need for the assessment and evaluation of EL as part of the agenda for EE (McBeth & Volk, 2010). In the report of the Working Group on Environmental Education (2007), accountability in the form of measuring the effectiveness of EE against clearly defined student achievement outcomes was one of the intended results and vision for EE in Ontario. According to the Working Group on Environmental Education, EL as an important product of any form of EE (teaching and programs) in schools and recommended the development and implementation of

transparent mechanisms and other assessment tools, different from report cards, for monitoring student achievement in EE.

While the concept of assessing EL is relatively new when compared to the number of years EE has taken the centre stage (Walsh-Daneshmandi & Maclachlan, 2006), several studies have documented the assessment of EL in other parts of the world (Alkaff, Garrison, & Golley, 2005; Bogner, 1999; Culen & Mony, 2003; Chu et al. 2007; Dimopoulos, Parakevvopoulos, & Pantic, 2008; Hsu, 2004; McBeth, Hungerford, Marcinkowski, Volk, & Meyers, 2008; Negev, Sagy, Garb, Salzberg, & Tal, 2008; ; Rovira, 2000; Roberts, 2008; Ruiz-Mallen, Barraza, Bodenhorn, Reyes-Garcia, 2009;Walsh-Daneshmandi, & MacLachlan; Leeming, O'Dwyer, & Bracken, 1995; Uzun & Keles, 2012; Wang, 2009; Zsoka, Szerenyi, Szechy, & Kocsis, 2013). Although a study by Lin & Qingmin (2012) explored individual and school related factors in EL among Canadian and U.S. students using 2006 PISA data, there is a paucity of studies on Ontario students' EL using instruments.

The availability of limited studies and baseline reference on Ontario students' EL for K-12 makes it difficult to state with confidence the degree of impact the EE programs are having in terms of improving students' EL. In light of the absence of a baseline data on K-12 environmental literacy in Ontario, or current research on EL for program evaluation and effectiveness, this research will provide a baseline reference on Ontario students' EL and also fill a niche in the area of scarce literature on student's EL in Ontario.

Personal Background and Philosophical Perspective

I am a certified secondary school geography teacher in Ontario, with a master degree in environmental geophysics pursuing a Ph.D. in EE. I consider myself a

passionate environmental educator. This fuels my interest in EE research especially in the areas of EL and EL assessment. Various defining moments shape us; some spur us to action while others may lead to life changing decisions. A moment in my teaching related to my journey as a Ph.D. student was one that I had as a geography teacher in a school designated an EcoSchool. The discovery that my school was an EcoSchools over the PA system came as a shock and a disappointment because I had not observed any activities that I would expect in a school with this designation.

Furthermore, as a geography teacher, a subject with generous environmental content, I was never aware or called upon to involve my students in the EcoSchools program activities. I began to wonder why an environment-related subject teacher[6] was not part of the program's certification process. I also questioned the effectiveness of the top-down approach the administration employed in the program's execution and the certification process. On further examination of the EcoSchools program, I discovered that the program had an abundance of resources that would have been beneficial to my students' knowledge and attitude towards the environment. It became obvious that my students and I had lost opportunities for more authentic learning experiences for that school year.

The puzzling question for me was whether some EE programs, like the EcoSchools, are being hampered by top-down administrative approaches which may exclude some relevant teachers in geography or science by not adequately involving them. As remarkable as it may seem to have a language teacher champion the EcoSchools programs or any EE program, relevant subject background that have significant environmental concepts embedded in their own curriculum should also be a part of it.

[6] Any subject teacher can be involved in the program.

The unintentional exclusion of relevant teachers deters full involvement of all relevant teachers from helping the students develop ecological literacy through curriculum integration.

After this experience, I set out on a quest to learn more about the status of the EcoSchools program and other EE programs in Ontario schools. I was interested in knowing how publicised these programs were? How involved the schools as a whole were in including all the teachers (especially teachers of subjects with high environment-related content—for example, geography, science, environmental sciences and civics) and students in implementing this program? Finally, I was curious about EL. I wondered if these programs were having any additional impact on students' EL.

I embraced a mixed method approach for this research. I recognized that I could not proffer explanation to every statistical observation I made based on the data alone, hence the mixing of methods in order to gain a deeper understanding and make meaning of the statistical results as suggested by Creswell (2014).

Hence, my lens is pragmatic. This approach is:

> Based on the principle that the usefulness, workability, and practicality of ideas, policies, and proposals are the criteria of their merit. It stresses the priority of action over doctrine, of experience over fixed principles, and it holds that ideas borrow their meanings from their consequences and their truths from their verification. Thus, ideas are essentially instruments and plans of action (Thayer, n.d).

In this research, I aligned with the pragmatic philosophical approach by utilizing procedures that worked for the study purposes.

Research's Theoretical Framework

A research theoretical framework refers to:

> The theory that a researcher chooses to guide him/her in his/her research. Thus, a theoretical framework is the application of a theory, or a set of concepts drawn from one and the same theory, to offer an explanation of an event, or shed some light on a particular phenomenon or research problem. (Sitwala, 2014, p. 189)

EL encompasses learning and outcomes, curriculum contents, environmental programs, and assessment of student's learning (assessment for and of learning in EE). The central focus of the study was on the efficacy of EE programs (EcoSchools) for EL acquisition among students. I took an eclectic approach is designing a framework for this research.

In conceptualising the theoretical framework (see *Figure* 1.1), I focused on the amalgamation of Gagne's instructional theory (Driscoll, 2005), the efficacy of EE program (Liebermann, 2013; Ontario Ministry of education, 2009; SEER, 2009), and Tyler's four curriculum process guiding questions on educational purposes, experience, organisation and determining whether this purposes are being attained (Parkay, Stanford, Vaillancourt & Stephens, 2005). I used these three concepts (principle and theories) to map a flow chart that linked curriculum to learning and assessment. It is within this framework that I situated my research.

Rationale for the theoretical framework. To select the theoretical framework, I took a look at the meaning of theory. Theory "is a way of thinking and a model of how things work, how principles are related, and what causes things to work together" (Hammond, Austin, Orcutt & Rosso, 2001, p. 15). Grippin & Peters (1984) defined theory as "a set of propositions that are logically related to one another…they are abstract

formulations of the connections between various phenomena" (p11). I also looked at the six functions of good theories they proffered.

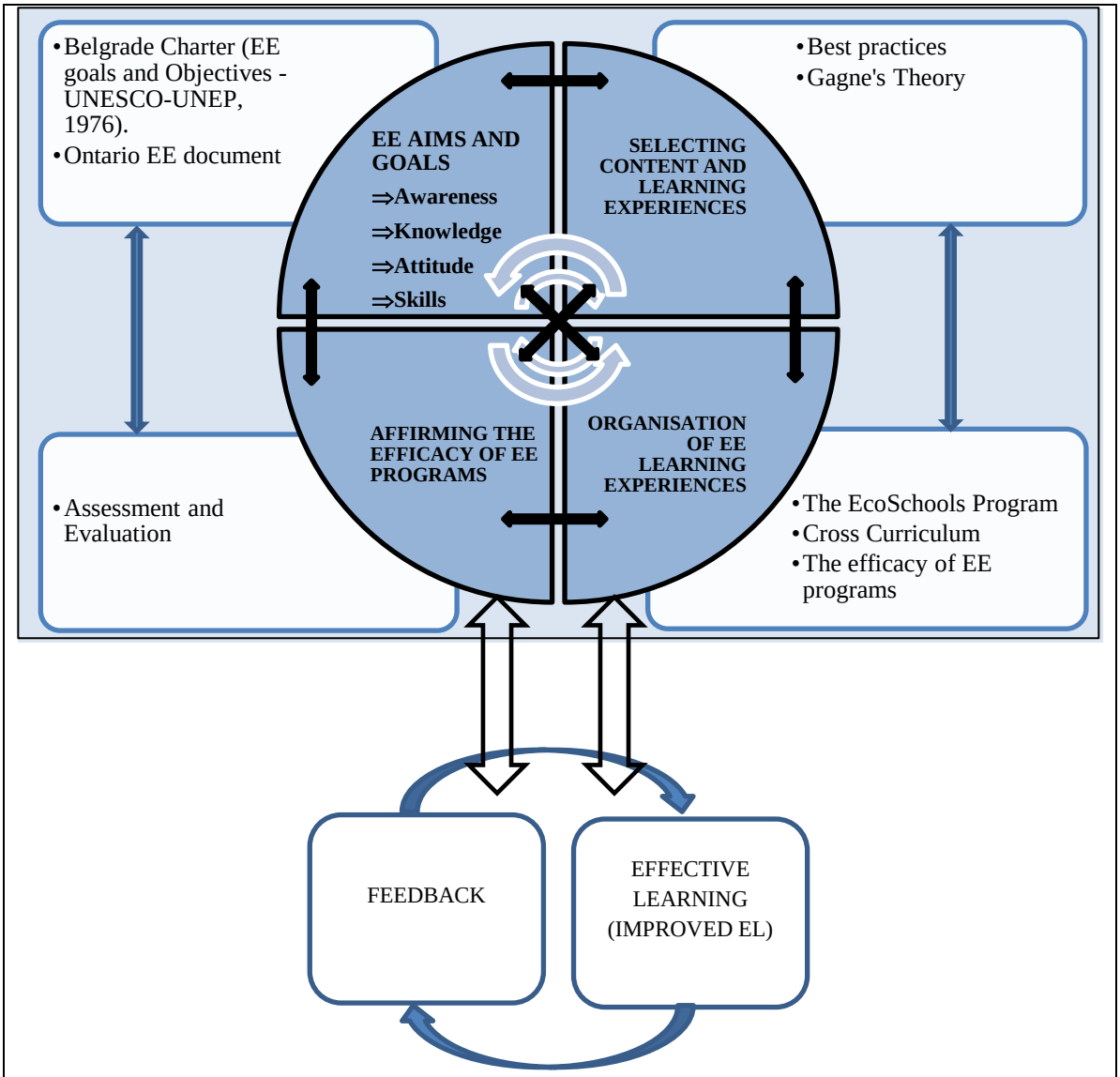

Figure 1.1. Theoretical/Conceptual Research Framework

First, they stated that theories help put facts together in a useful way. They likened facts to a list of ingredients for pie and theory as the recipe that show or instructs one on how to put the ingredients together to make the pie (p. 4). Second, theory provides a set of

principles to which events experienced in the data collection can be related (p.5). In addition, theories explain in two different ways; descriptive and prescriptive. Descriptive by telling what phenomenon exist and prescriptive by attempting "to answer the why question and thus suggest potential intervention strategies" (p. 6).

Also, theories have heuristic values. They help the researcher ask good questions and once the basic theory is established, it helps the researcher see "where connections seem likely and where there are loopholes in the information" (p.6). Furthermore, it makes predictions possible and tries to decrease unexpected results by carefully describing the necessary circumstances for the theory to predict events. As a result, good theories can be tested and used to predict. Finally, good theories are parsimonious. For example, it "must be the simplest formulation possible that takes into consideration all the data while still maintaining appropriate precision" (p.8).

The amalgamation of Gagne's instructional theory and Tyler's curriculum rationale provided the framework for the following in the research: Relating and reviewing the goals of the EcoSchools program in terms of EL and how much these are being met; a basis for an examination of the learning experiences provided by the EcoSchools program and how these learning experiences are influencing EL; a rationale for reviewing the context under which these learning experiences are organized and their effectiveness in fostering EL; and finally, the justification for gauging the effectiveness of these learning experiences through the assessment of student's EL in schools with and without the EcoSchools program.

Figure 1.1 shows the visual representation and relationships between the various elements of this research, captured within Tyler's curriculum rationale in a cyclic pattern to depict a process.

Gagne's Instructional Theory

Gagne believed that events in the environment influenced the learning process (see *Figure* 1.2). His theory identified the general types of human capabilities that are learned (International Centre for Educators' Learning Styles, n.d).

Gagne, Wager, Golas and Keller, (2005) posit that instruction will facilitate learning when it supports the internal events of information processing (p. 9). The process of instruction, which is the external event have to become aligned with internal events to support the different stages of the process. Thus, Gagne, Wager, Golas and Keller (2005) defined instruction "as a deliberate arranged set of external events designed to support internal learning processes" (p. 10). The events of instruction as outlined by Gagne's instructional theory are:

1. Stimulation to gain attention to ensure the reception of stimuli
2. Informing learners of the learning goals to establish appropriate expectancies
3. Reminding learners of previously learned content for retrieval from long term memory
4. Clear and distinctive presentation of material to ensure selective perception
5. Guidance of learning by suitable semantic encoding
6. Eliciting performance, involving response
7. Providing feedback about performances
8. Assessing the performance involving additional response feedback occasions
9. Arranging variety of practice to aid future retrieval and transfer. (Gagne, Wager, Golas and Keller, 2005, p. 10)

Hence, the process of planning instruction systematically "to achieve learning is characterized by a process of stating goals, selecting or developing instructional

interventions, and using feedbacks from learners to improve the instruction" (p. 12); should be the goal of programs designed for learning.

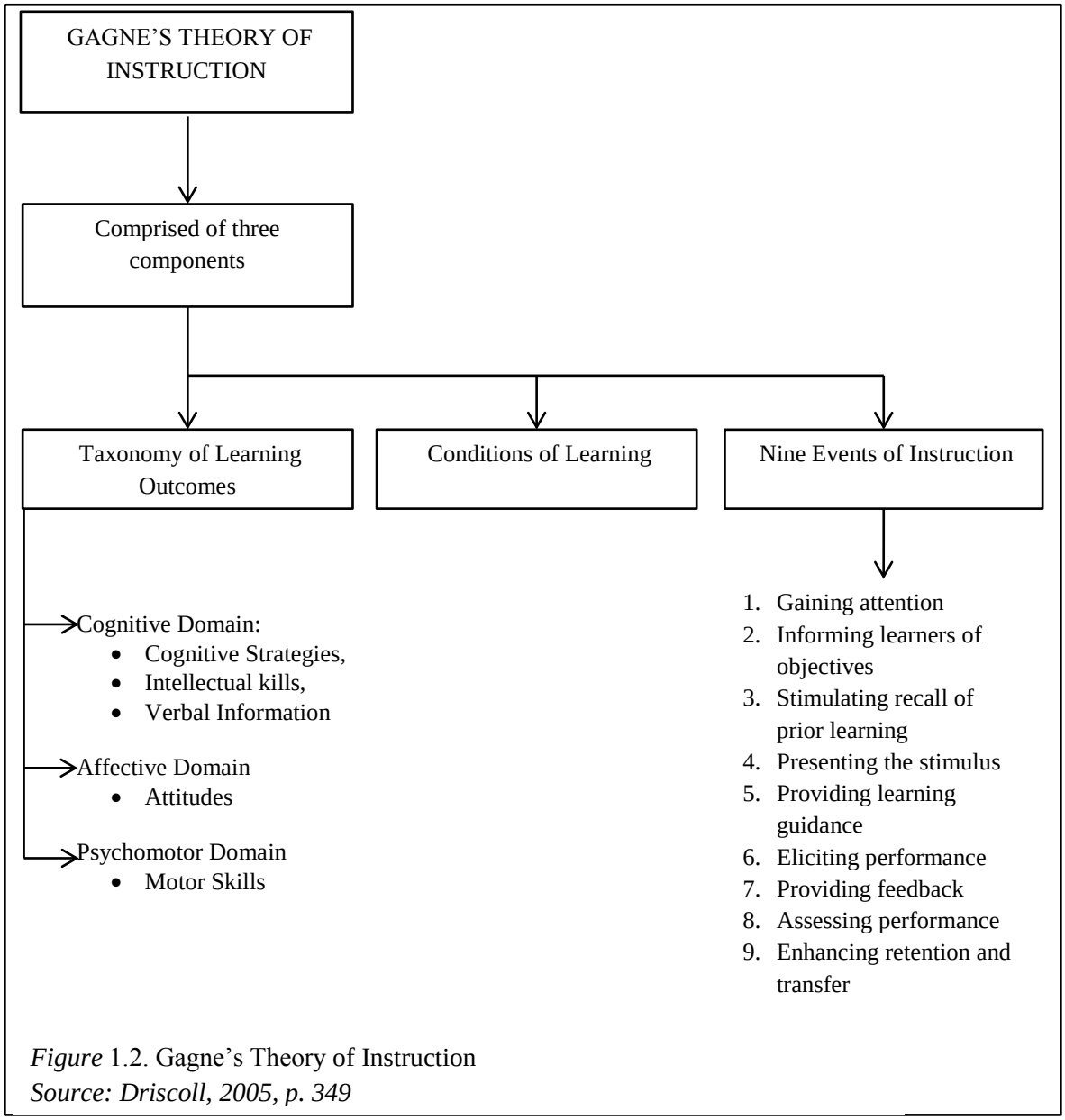

Figure 1.2. Gagne's Theory of Instruction
Source: Driscoll, 2005, p. 349

Effective instructions have outcomes —learning. Learning occurs when an individual acquires a particular capability to do something (Gropper, 1983) or "when experience causes a relatively permanent change in an individual's knowledge and behaviour" (Woolfolk, Winne & Perry, 2004, p. 232). The outcomes of learning are

displayed through “changes in behaviour that cannot be explained through the normal process of maturation or medication and are persistent over time (as cited in Grippin & Peters, 1984, p.15).

Gagne defined learning as

> A change in human disposition or capability, which can be retained, and which is not simply ascribable to the process of growth…and the inference of learning is made by comparing what behaviour was possible before the individual was placed in a ‘learning situation’ and what behaviour can be exhibited after such treatment. (Gagne, 1970, p. 3)

Change, Gagne further stated is “an increased capability for some type of performance. It may also be an altered disposition of the sort called “attitude,” or “interest,” or “value”” (pp. 3-4). For example, a learner who is participating in a situation where the right conditions for learning are invoked may experience the five categories of learning outcomes (types of learning) that include the following human capabilities of intellectual skills, verbal information, cognitive strategies, motor skills, and attitudes.

- Intellectual skills (“knowing how” or having procedural knowledge)
- Verbal information (being able to state ideas, “knowing that”, or having declarative knowledge)
- Cognitive strategies (having certain techniques of thinking, ways of analyzing problems, and having approaches to solving problems)
- Motor skills (executing movements in a number of organized motor acts such as playing sports or driving a car)
- Attitudes (mental states that influence the choices of personal actions). (International Centre for Educators’ Learning Styles, n.d. para. 12)

Tyler's Curriculum Rationale

Tyler's curriculum rationale as highlighted by Parkay et al. (2005) is based on the following key questions or considerations:

- What educational purposes should the school seek to attain?
- What educational experiences can be provided that are likely to attain these purposes?
- How can these educational experiences be effectively organised?
- How can we determine whether these purposes are being attained? (p. 298)

In this research, I equated each of Tyler's rationale to various aspects of EE in the educational system. The first rationale, is the purpose of EE education that the schools seek to achieve (environmentally literate and responsible citizen), the education experiences in this instance is the EcoSchools program embraced by the schools, the third rationale is equated to the organisation of the EcoSchools program and finally the last rationale is EL assessment which should also a goal of EE curriculum/program.

Curriculum. Curriculum has many definitions. However, one definition that underscores the importance of assessment in learning is one that defined it as "a plan for achieving intended learning outcomes: a plan concerned with what is to be learned, and with the results of instruction" (Unruh& Unruh, 1984, p. 96). Considering this definition, it is logical to assume that if curriculum is a strategy to achieve intended learning outcomes, there must also be a plan to determine if learning has occurred, otherwise, curriculum may just be an opportunity with no consideration or regards for outcomes.

Unruh and Unruh expanded further:

> Learning outcomes include knowledge, attitudes, and skills. [Where] Knowledge encompasses facts, information, principles, and

> generalisations that help an individual understand his or her world better. Attitudes include values, believes…appreciations…skills are techniques, processes, and abilities that enable the individual to be versatile in using knowledge and physical resources effectively to extend the horizons of his or her world. (p. 96)

Furthermore, Parsons and Beauchamp (2012 highlighted the role and function of the Curriculum as:

> The foundation of the teaching-learning process. The development of programs of study, learning and teaching resources, lesson plans and assessment of students…are all based on curriculum. As a process, curriculum development is concerned with reviewing, planning, developing, implementing and maintaining curriculum, while ensuring that the stakeholders engaged in this process have a high level of commitment to and ownership of the curriculum. (p. 25)

Selection on the other hand is the inherent sources of the curriculum including books and other materials (Unruh & Unruh, 1984). In selection, the interconnectedness of knowledge, attitudes, and skills and the fact that none can occur independently is emphasized. Finally, the structural element of curriculum deals with the order or sequence or the immateriality of order in a given instance.

Another definition of curriculum that further highlights the importance of assessment is the definition by Pinar, Reynolds, Slattery and Taubman (2000). They defined curriculum as "the entire range of experiences, both undirected and directed, concerned in unfolding the abilities of the individual; or…the series of consciously directed training experiences that the schools use for completing and perfecting the unfoldment" (p. 27).

It is safe to assume that if an unfolding of abilities occur for individuals, it had to be an ability that was previously latent (or non-existing) and hence unobservable;

therefore, in order to determine or confirm an unfolding, a form of observable behaviour has to be evident or in a situation where such a behaviour or characteristics is not easily observed, a measure or an assessment yardstick has to be used in order to confirm a definite change in behaviour.

Implication of the Theories for Curriculum/Program Development

Teaching and learning time in Ontario high school is broken up into teaching periods. The curriculum is divided into subjects and assigned to individual teachers. Hence, learning in high schools may be described as fragmented (Naested, Potvin, & Waldron, 2004, p. 191). Teaching across curriculum using a multi-disciplinary approach may be more feasible in elementary schools since only one teacher may be in charge of handling multiple subjects. However, for high schools, multi-disciplinary approach in the curriculum may encounter several obstacles and in most cases leave learners to make those connections —the connectivity between subjects (Naested, Potvin, & Waldron, 2004).

The Ontario EE framework also recognised the multidisciplinary nature of EE and therefore encourages an "integrative undertaking that allows for teaching across disciplines" where educators will need to acquire "the skills to link approaches and content from various disciplines to help students understand complex environmental issues and guide them towards environmental literacy" (Ontario Ministry of Education, 2009, p. 11).

The policy framework for EE in Ontario identifies that education plays a key role in helping "young people understand the nature and complexity of environmental challenges and build their capacity to take appropriate action" (Ontario Ministry of Education, 2009, p. 3). The policy framework also agrees with available research that EE

not only improves EL, but also "contribute to higher achievement for all students" (p.5), due to its power to foster students' engagement. The Ontario EE framework promotes the following: 1) Integrated approach to EE, 2) targeted approach to professional development, 3) community involvement, 4) models for guiding implementation, 5) reviewing programs—measuring progress, assessment and evaluation (p.5). The Ontario EE framework has three goals:

1. Helping all students acquire skills, knowledge and understanding of their connection to the world around them
2. Increasing student engagement by encouraging active participation in environmental projects and building connections between school and communities
3. Increase the ability of the leaders to execute evidence-based EE program, practice and operations. (Ontario Ministry of Education, 2009, p. 11-18).

The above goals are "organized around the themes of teaching and learning, student engagement and community connections, and environmental leadership" (Ontario Ministry of Education, 2009, p. 8). The framework outlines the various strategies for achieving the goals of EE in Ontario schools at the Ministry, board and school levels.

Implication of Theories - Environmental Education Efficacy for EL

The efficacy of EE for fostering better learning among students and making meanings across various learning concepts and disciplines is an accepted fact (Lieberman, 2013; Liebermann & Hoody, 1998; Ontario Ministry of Education, 2009), hence, the justification for the promotion of several environmental-base education (EBE) and EE programs.

Due to the efficacy of EE, several EBE have taken off. An example is the EIC Model (Environment as an Integrating Context for Learning) developed my SEER (State

Environmental Education Roundtable) for implementing programs that use the environment as a context for teaching and learning (Lieberman, 2013). Lieberman highlighted the six key pedagogical principles the EIC model brings together:

- Interdisciplinary instructional approach,
- Hands on learning community-based learning experiences,
- Collaboration among teachers,
- Learner centered approach to instruction that adapts to students' strength,
- An amalgamation of independent and cooperative learning, and finally,
- The immediate natural community as the context for making connection.

Operating with these six principles, research strongly showed that students participating in such programs benefited in the following areas:

a. Improved academic achievements including improved scores on standardized test,
b. Better engagement in learning and less classroom related behavioural incidence,
c. Better preparation for life outside of school whether college of careers (Lieberman, 2013).

Definition of Key Concepts

A number of terms used in this proposal form the foundation for this research (for example, environment, EL and EE). Therefore, in this section, various terminologies frequently used are defined.

Environment. The word environment is from the French word *environner*, meaning to surround (Brennan & Withgott, 2005). It is the sum total of our surroundings

that include all of the abiotic factors (nonliving things) and the biotic factors (living things) which comprise the built environment and all the human-made urban cities.

From the definition of the word environment, the apparent emerging themes on what the environment includes are:

1. The built environment consisting of constructed surroundings that provide the setting for human activity which ranges from the large-scale civic surroundings to the personal places;
2. The biophysical environment which comprises the physical and biological factors along with their chemical interactions that affect an organism;
3. An obvious complex interaction between the environmental entities which include the political, economic and cultural systems and the living things.
4. The external tangible nature of the environment.

Environmental education. The definition of EE is contested, and there is no unity or agreement on one specific definition of the word EE (Disinger, 2005). According to Russell, Bell and Fawcett (2000), "approaches and definitions of environmental education vary by culture, reflecting diverse relationships to their environment" (p. 198). If going by the amount of culture that exist in the world is an indication of the number of definition of EE that exist, then it is no wonder that there are a plethora of definitions with little agreement on any acceptable one. For this study, I will be using the definition proffered by the Working Group on Environmental Education (2007) where EE was defined as:

> Education about the environment, for the environment, and in the environment that promotes an understanding of, rich and active experience in, and an appreciation for the dynamic interactions of:

- The Earth's physical and biological systems
- The dependency of our social and economic systems on these natural systems
- The scientific and human dimensions of environmental issues
- The positive and negative consequences, both intended and unintended, of the interactions between human-created and natural systems. (p. 6)

Environmental literacy (EL). Roth (1992), defined EL as "essentially the capacity to perceive, interpret the relative health of the environmental systems and take appropriate action to maintain, restore, or improve the health of those systems" (p. 10).

Another definition of EL, though referred to as ecological literacy (used synonymously with EL in this study) is one proffered by Orr (1990). Orr in his definition of ecological literacy referred to it as "a quality of mind that seeks out connections ... a broad understanding of how people and societies relate to natural systems, and how they might do so sustainably" (pp. 3-4). Orr further stated that an environmentally literate person also presumes "an awareness of the interrelatedness of life and knowledge of how the world works as a physical system" (p.3).

A definition that highlights the components of EL is the one given by Hollweg et al. (2011), who defined EL as the:

> Knowledge of environmental concepts and issues; the attitudinal dispositions, motivation, cognitive abilities, and skills, and the confidence and appropriate behaviors to apply such knowledge in order to make effective decisions in a range of environmental contexts. Individuals demonstrating degrees of environmental literacy are willing to act on goals that improve the well-being of other individuals, societies, and the global environment, and are able to participate in civic life. (pp. 15-16)

This definition illustrates the two facets of EL. The first is the emphasis on knowledge and skill acquisition by an individual and the other side, the behavior and actions towards the environment as informed by knowledge and skills (the cognitive and the non-cognitive aspect of EL).

EL assessment. In this study, EL assessment will connote a formal data gathering in the area of EE and a combination of this data to reach an overall judgment. EL assessment will serve as a diagnostic process used to determine the level of EL in the participating school board acquired through school environmental programs and their education. Hence, EL assessment is defined as a process of determining the level of individuals' capacity to perceive and interpret the relative health of the environment and take appropriate action to maintain, restore, and improve the health of the environmental systems.

Justifying the interchangeable use of the terms ecological and environmental literacy

The Ontario EcoSchools mission statement indicated that the "Ontario EcoSchools is an environmental education and certification program for grades K-12 that helps school communities develop both ecological literacy and environmental practices to become environmentally responsible citizens and reduce the environmental footprint of schools" (Ontario EcoSchools, para 1, n.d).

In Orr's explanation of what it meant to be ecologically literate, he purported that it "require[s] the more demanding capacity to distinguish between health and disease in natural systems and to understand their relation to health and disease in human ones" (Orr, 1989, p. 334).

On the other hand, EL definition by Hollweg et al. (2010) sees EL as the knowledge of environmental concepts and issues and in addition to attitudes, motivation

and skills required to choose and display appropriate environmental behaviors and make effective environmental based decisions.

Looking at what ecological literacy to include, it can be deduced that EL is a wider umbrella under which ecological literacy is covered. EL comprises ecological knowledge as well as environmental attitudes, skills, and behaviors. A closer look at one the EcoSchools objectives (see Ontario EcoSchools, 2010, p. 2) indicated that the EcoSchools helped schoolboards to promote ecological literacy but also went beyond this to include the promotion of "environmental practices to become environmentally responsible citizens and reduce the environmental footprint of schools" (EcoSchools, n.d). The inclusion of environmental practices promotion and responsible citizens go beyond the scope of Ecological literacy and into EE.

In the EcoSchools' mission statement, it is not clear whether the term ecological (pertaining to ecology which is "the study of the relationships between organisms and their environment" (Freedman, 2010 p. G-4) and environmental (relating to the environment – see definition above) is supposed to connote two different meanings.

It is also noted that in Orr's discussion of EL and ecological literacy (Orr, 1990), Orr makes no distinction between EL and ecological literacy in his discussions. Therefore, since the EcoSchools mission statement stated ecological literacy as their focus and in their objective statement indicated EL, it is assumed for this research that the terms were used interchangeably and for this research, the terms will also be used interchangeably.

Delimitation of Study

This study was designed to assess EE, using the Middle Schools Environmental Literacy Instrument Survey (MSELS), in secondary school students, in a school board

that implemented the EcoSchools program to enable comparison of outcome of students' EL in schools implementing the program and the scores of students in schools that were currently not implementing the program and therefore should not be construed as a cause and effect study.

As a result of the age composition of the organisations that provided the students sample, a very few number of pupils in elementary and grade nine participated in this research and the results were displayed. Notwithstanding this inclusion, the study was designed for secondary school students in high school.

This study does not seek to provide explanations on how the various EL components in the MSELS influenced each other, but a study to assess the current level of EL in two categories of schools: Eco and non-EcoSchools. Also, this study included an investigation of teacher co-ordinators' perceptual view of the EcoSchools' program: what they currently do, what works and what needs to change in order to have a more functional platform.

CHAPTER 2

LITERATURE REVIEW

The pathways taken with this literature were determined by the close examination of various topics that would provide further insight into EL assessment in Ontario schools and topics related to the purpose of the study. These pathways include EE programs, classification of EE programs into three major categories, major EE programs in Ontario (EcoSchools and EarthCARE™) and their characteristics, issues in adapting and defining characteristics of successful EE programs, the prospects of EE, the concept of EL, domains/strands or components of EL, as well as previous studies on EL assessment.

EE Programs

A current and major trend in EE (globally and locally) is the use of EE programs and initiatives for teaching EE and creating environmental awareness in schools. These EE programs and initiatives contribute to gains in knowledge and shifts in attitude (Iozzi, 1984; Rickinson, 2001; Volk & McBeth, 1997), as education systems around the globe continue to use them. As organizations and schools develop several strategies and creative ideas for teaching class and school-wide EE, school curricula is constantly being re-written to accommodate EE (Eames, Cowie, & Bolstad, 2008). In this section, several global and local EE programs will be examined in order to gain insight into how they are organised both locally and globally.

Various EE programs and initiatives like The EcoSchools, EarthCARE™ Program (2004), Classroom Earth, Environment as an Integrating Context for Learning Program - The EIC Model™ (SEER, 2000), Outdoor Education, (Auer, 2008; Chernos, 2007), Sustainability Modelling (Higgs & McMillan, 2005), Eco Regeneration Field Study (Lanigan, 1998), EcoSchools, EarthCARE™, Green School Program, Environmental

Club, Go Green Initiatives (Education, 2007; Miners, 2007; Regional Roundup Group, 2006a; Regional Roundup Group, 2006b), School Yard Greening (Tree Canada, n.d.), Water Shed Project (Greig, 2002; Overholt & MacKenzie, 2005), and Tree Planting (Sayers, 2007) are just a few examples of EE programs that have been used in the past or are currently in for developing a more environmentally literate citizenry in schools. These initiatives are used for developing in students;

- Better understanding of the environment,
- The skills needed to better deal with environmental issues,
- Increased environmental awareness,
- High levels of EL in students.

In the wake of the recommendation of the Report of the Working Group on Environmental Education (2007), affirming that "school boards should be supported in their efforts to develop board-wide frameworks for EE that would reflect the board's culture and that of its community and partners" (p. 12), EE programs in Ontario, like the EcoSchools and EarthCARE™ have garnered province-wide acceptance.

An increasing number of elementary and secondary schools are adapting them as a means of injecting meaningful EE into the curriculum and engaging students in responsible environmental behaviour. School environmental programs, however, are characterized by differential levels of success and effectiveness. In Ontario, the EcoSchools and EarthCARE™ programs have been particularly successful in the sense that there has been a wide acceptance, and a steady increase in the number of schools participating yearly in these programs.

The EcoSchools program in Ontario aims at recognising schools with stellar environmental practice in compliance with the program's specification, by awarding participating schools gold, silver or bronze EcoSchools certification. Yet, the uncertainty that remain is whether the effort and process of school certification is limited to administration, teacher, and students; or rather a collective equal part effort from the 3 parties.

Categories and Nature of Environmental Education Programs

A closer look at the documented EE programs reveals a common theme. The themes that emerged show that the varieties of EE programs available based on their objectives and overviews can be grouped under the following broad categories;

- Multi-facet programs,
- Single-facet programs.

While a number of specific examples are provided under each heading in this literature review, there are many of programs that fall comfortably under any of the above headings and any attempt to tease out the specifics leaves concepts and contents hanging. While the programs have been categorised under these two divisions in this literature review for easy description, it is by no way suggesting that all programs fall entirely within a specific category. Although each program has been categorised based on a common group characteristic, all EE programs share a common goal in that they all aim at offering creative and effective ways of including EE in the everyday school curriculum and fostering EL in students (see objectives of various EE programs in Education, 2007; Greig, 2002; Higgs & McMillan, 2005; Miners, 2007; Overholt & MacKenzie, 2005; Regional Roundup Group, 2006a; SEER, 2000).

Multi-facet EE programs/initiatives. Multi-facet initiatives encompass all EE programs built around multiple objectives and designed to address more than one environmental issue. A few of the EE programs that share these common characteristics are discussed below.

Sustainability modeling. This program involved teachers modeling sustainable behaviour by driving hybrid cars, biking, carpooling, walking to school and doing anything that will indicate they were practicing sustainability. Basically, EE was through 'osmosis' (Higgs & McMillan, 2005).

Friends of nature antelope car. Sayers (2007) studied another EE program with multiple objectives. This was a mobile EE unit that traveled from school to school and events in the surrounding rural areas in Beijing. It provided a range of activities that were focused on various environmental issues (Sayers, 2007).

Environment as an Integrating Context for Learning Program —The EIC Model™).The term EIC was coined by the State Education and Environmental Roundtable - SEER (2000), to encompass the educational practices which SEER believes should make up the foundation for environmental-based education for schools in America adopting EIC as a framework for education – "a framework for interdisciplinary, collaborative, student-centered, hands-on, and engaged learning" (SEER, 2000 and the SEER website — http://www.seer.org /— provides a detailed description of *The EIC Model™)*. Research findings on this model of EE program strongly show strong evidence of improved students' achievement while using the environment as an integrating context for learning.

Eco Regeneration field study (Fighting Island).This program is a very unique EE program embraced by a southern Ontario School Board. Fighting Island is located in the

Detroit River between Detroit, Michigan and Windsor, Ontario. BASF Corporation and its predecessor companies have owned the Island since 1918. The program highlighted the success of very vigorous and determined efforts to regenerate a polluted piece of island. The success story is shared with hundreds of students in the surrounding schools across the area while they take part in a well organised nature study and curriculum (science and geography) activities.

Go Green Initiatives (GGI).Green Schools initiatives are popular programs all around the world in the bid for a more sustainable school system (Zhenya, 2004; Zhongguo, 2004; Regional Roundup Group, 2006a; Regional Roundup Group, 2006b; Regional Roundup Group, 2006c; Regional Roundup Group, 2006d; Education, 2007; Sayers, 2007). GGI and EE programs are now embedded in school buildings with government led GGI at the fore front. The Go Green School processes are very similar to the Ontario EcoSchools certification program. Sayers (2007) explains that "to become a Green School, a committee must be set up within the school, ideally made up of the principal, teachers, students, parents and environmental experts" (p. 7). It is the duty of the committee to evaluate the initial environmental condition of the school and design a plan of action to address areas of need.

Single-Facet Programs/Initiatives and Examples. Other forms of EE programs are developed around a singular objective or focus in order to address an environmental issue. Unlike the multi-facet programs with several focus and objectives, the single-facet programs are EE initiatives developed under a specific environmental issue or targeted towards meeting a specific objective. For example, Stream monitoring (Overholt & MacKenzie, 2005), studying a polluted river or a watershed (Greig, 2002) and investigating endangered fruit bats in an area (Trewhella et al, 2005) all geared towards

offering deeper understanding and solution to a particular issue and very specific in its course of action towards that singular purpose.

Single-facet initiatives usually focus on a single concept or objective and strive to increase knowledge, create general awareness, and proffer solutions for that particular issue. They are easier to implement and in the absence of huge resources, classroom teachers can usually custom them to fit in with their teaching needs.

Single-facet EE initiatives are not construed as standing alone, they are also connected to other aspects of environmental issues and themes. But for the specific purpose of this literature review, single-facet EE are programs that focused on a singular issue as the major theme for teaching EE. For example: Tree planting (Sayers, 2007), Re-cycling programs (Sayers, 2007), Biophysical environmental issue programs (Greig, 2002; Overholt & MacKenzie, 2005; Trewhella et al. 2005;), School yard greening (Tree Canada, n.d., p. 1).

Online Initiatives and Resources. Several ideas that pertain to specific topics in EE can be found on numerous authentic websites. There is therefore not need to 're-invent the wheel'. There are environmentally based international and local organizations whose websites are filled with great information, projects and initiatives that can be modified by teachers for use in their various classrooms.

Although several of these sites are free, a few of them may require a form of memberships, lessons abound and the web has become a conglomeration of EE lessons, programs and activities waiting to be explored. Online materials vary from photos to interactive maps, lessons, interactive quiz and test, competition in EE, blue prints for projects and initiatives and so on. The sites are numerous and diverse and have greatly minimised the popular lack of time, resources or idea excuses as hindrances to inclusion

of EE programs or initiatives. Three examples of online resources that teachers and environmental educators may expect to find ideas, funding, projects and initiatives relating to EE include:

Classroom Earth. This is a web resource intended to help high school teachers add environmental content to their daily lesson plans and "exchange resources, ideas and success stories for integrating environmental content into every day lesson plans" (National Environmental Education Foundation, 2008, p.6).

EcoSchool Designs. This initiative is a website that has a list of several Schoolyard Greening Organizations in the USA, Canada and UK with link. Teachers and educators can then navigate into these sites to access information and instruction on how to undertake a school yard greening project. It also includes organizations that offer funding for school yard greening proposals — (http://www.ecoschools.com/KeyOrgs/KeyOrgs_wSidebar.html).

Google Earth - This is probably one of the most underappreciated online resources, maybe due to lack of lessons that ties it to a specific curriculum. Google Earth has a wealth of resources for teachers interested in mapping changes over time in various locations. It can also offer a wealth of resources for teachers and educators interested in studying and analysing the habitats of various species (Tanner, 2010).

EcoSchools Program in Ontario, Canada

The EcoSchools program can be classified as a multi-faceted EE program. The EcoSchools is an EE program in Ontario designed for K-12 and was developed and run by schoolboards in Ontario. In the EcoSchools mission statement, it purports that it "helps school communities develop both ecological literacy and environmental practices to become environmentally responsible citizens and reduce the environmental footprint of

schools" (Ontario EcoSchools, n.d.). Its vision is to see every school become an EcoSchool where all students and staff in Ontario schools will be engaged in EE and practices, developing the knowledge, skills, perspectives, and actions needed to be environmentally responsible citizens (Ontario EcoSchools).

The Ontario EcoSchools program also aims to improve school building operations in order to reduce human ecological footprints in key areas such as solid waste, environmental impacts and overall energy consumption. The program, developed in 2002, addresses environmental issues and provides an EE program that can be infused into the Ontario curriculum.

The program offers resources and environmental perspective to various choices made in operating schools and in planning classroom programs based on the Ontario Curriculum. It is aligned with all the goals and strategies of the framework for EE in Ontario — Acting Today, Shaping Tomorrow (Ontario Ministry of Education, 2009).

All participating EcoSchools and school boards try to reflect the goals and strategies outlined in the Ministry of Education's framework for EE (Ontario EcoSchools[a], n.d.). The program has developed a comprehensive guide for schools to use in order to reduce their energy use, minimize waste, design school buildings and grounds to reduce non-renewable energy use, and encourage sustainability, greater participation in environmental initiatives and student leadership (Smith, 2010, p. X).

The Ontario EcoSchools helps school boards to:

- promote environmental literacy for all students;
- establish environmentally sound operational practices;
- develop a process for continual improvement in environmental education and operational practices within each school, and

- Incorporate an environmental education component into the school planning and review process. (Ontario EcoSchools, 2010, p. 2).

Guiding principles. The EcoSchools programs are guided by a set of four fundamental principles centered on students, innovation, accountability and capacity building. Reiterating the importance of EL, ecological literacy and environmental learning is embedded within its student centred and innovative principles. The four guiding principles as highlighted on EcoSchools website are:

Student Centred

- Supports student-centred learning and action within the student's sphere of influence
- Provides engaging resources to develop ecological literacy

Innovative

- Ongoing development of resources and support that progressively improve environmental learning and school operations
- Annual revision of certification program

Accountable

- Committed to transparency and integrity through the certification program
- Sharing best practices, lessons learned and data gathered to inform environmental education,

Capacity building,

- Provide resources and support for school boards and schools to develop capacity to deliver, support and implement sustainable environmental education initiatives (Ontario EcoSchools, n.d, para. 6).

Certification process. The EcoSchools program includes a certification process that recognises schools for their environmental initiatives, innovations and achievements by awarding either a bronze, silver of gold status to schools depending on how well the

schools has met the requirements of the program in these six main components: a) Teamwork and leadership, b) Energy conservation and, c) Waste minimization, d) School ground greening, e) Curriculum, and f) Environmental stewardship. In the point system used for certification, schools must achieve a minimum of 75 points in the aforementioned six categories to be awarded the gold standard (Ontario EcoSchools, 2011).

The Ontario EcoSchools program help schools and school boards achieve these objectives by:

a. Promoting ecological literacy for all students with teaching resources linked to the Ontario curriculum;
b. Providing opportunity for leadership for students through the establishment of EcoTeam;
c. Establishing environmentally sound operational practices through the adaptation of the Ontario EcoSchools templates for use throughout the board;
d. Developing a continual process for improvement in EE and operational practices within each school through the initial and follow-up EcoReviews
e. Incorporating an EE component into the school planning process through the creation of a board-level environmental committee
f. Providing an opportunity for the whole school community to work together to develop environmentally-responsible practices at school through the Action Plan templates
g. Benchmarking their environmental practices, assessing their progress and recognizing their achievements through an annual certification process. (Ontario EcoSchools, n.d.)

The certification criteria changes every year, schools interested in becoming a certified EcoSchools may reapply for certification yearly, and will have to successfully

show documents to support their application. Site visits are conducted every alternate year in order to verify individual schools' application. Six main areas serve as road map where students can participate and schools teams can pick and choose what they would like to participate in and implement. The six areas are as highlighted by the Ontario EcoSchools (n.d) are:

1. Team work and leadership where schools establish Eco-Teams and cultivate school-wide communication through;
    a. Diverse Eco-Teams with students and adult representation
    b. Strong communication systems including school-wide campaigns, visual displays, and regular meetings.
    c. Students' leadership through school announcements for eco-actions, launching campaigns and school wide presentations.
2. Energy Conservation which will focus on daily practice and school building procedures like the following:
    a. Switching off lights and classroom equipment when idle.
    b. Heating and cooling conservation through common practices like closing curtains.
    c. Monitoring and communicating school's daily practices and communicating findings with the school community.
3. Waste minimisation through:
    a. Waste reduction in school using various campaigns such as; waste-free lunches and composting.
    b. Establishing a good re-use system for example, the Good On One Side (GOOS) system.

    c. Recycling program and efficient use of the EcoSchool tri-bin (blue, black and red bins.

4. School ground greening that engages students through the following;
    a. Planting and maintaining a green school yard like a classroom or garden.
    b. Increasing plants diversity through native species planting.
    c. Outdoor education using the greening project to enrich learning.
5. Curriculum that emphasizes the environmental as an integral and daily part of the teaching and learning process through;
    a. Focusing curriculum to have elements of teachings in, about and for the environment and encouraging environmental advocacy.
    b. Classroom lessons promoting distinct environmental learning outcomes.
    c. Engaging in off-site field trips to promote nature contact and appreciation.
6. Environmental stewardship that emphasize the whole school approach that links learning about the environment with actions that address environmental issues through;
    a. Whole school environmental action and active participation on specific issues.
    b. Going beyond the confines of the EcoSchools program stipulations and engaging in exemplary environmental actions.
    c. Learnings about the environment that is well linked with a relevant environmental issue.

Figure 2.1 provides a summary of the certification process.

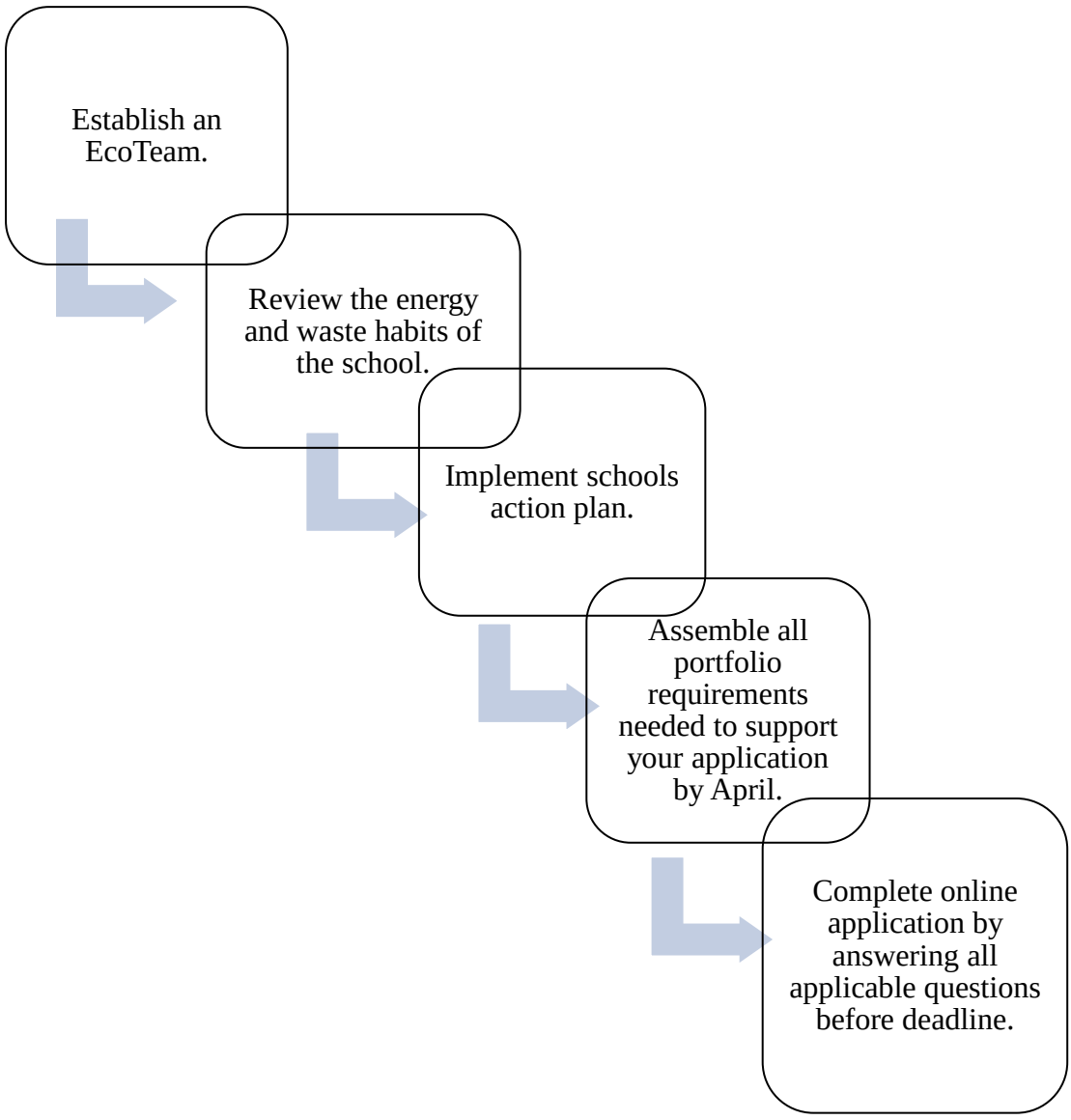

Figure 2.1: Five Stages of the EcoSchools Certification Process – A sequential order of the 5 main stages of EcoSchools certification for schools (*Source:* Ontario EcoSchools, 2011).

Highlighting Desirable Characteristics of EE Programs

Whether one is choosing to develop or use an already existing program, it is important to bear in mind that some programs may be more appropriate than others in

terms of achieving some set goals. It is also vital to note that for an EE program or initiative to have a decisive impact and meet its' goal, it has to have some defining characteristics.

Some other things like the infectious personality and attitude of the initiating teacher or strong administrative support to ensure an environmental conscious school may play a role in ensuring the success of an EE program.

Also, in one of the aims of the EcoSchools program is to have teachers are to play a major role in helping the students develop ecological literacy through the curriculum. The ideal situation would be to include all teachers in EE, but in a situation where this is not feasible, effort should be made to include all relevant subject area teachers who are well grounded in their knowledge of the environmental.

In addition to the aforementioned, a few other characteristics, if present in an EE program or initiative may also go a long way in ensuring that programs meet their goals of improving students environmental literacy and creating an informed environmental citizenry. These are discussed in the following sections.

A program should not be left to speak for itself. Teachers and educators should not rely solely on any initiative to speak for itself. That is, expecting learning to take place without deliberate effort to initiate learning. In programs and initiatives that teachers have failed to utilize the opportunity presented to lay a solid foundation for various environmental principles, but rather relied on the program to speak for itself, with students constructing their own learning with limited background information, the intended program objectives may not be realised. For an initiative done outside the curriculum with no background teaching or connection to classroom lessons, such

programs when left alone to speak for itself may not speak coherently on may in some cases, speak in a language the students may not understand.

Higgs and McMillan (2006) claimed that green facilities have the benefits of helping students learn about sustainability through osmosis. However, failing to lay the background knowledge for sustainability may prevent the students from making full connection with concepts of programs and initiatives via 'osmosis'. Similarly, Dyment (2005a) expressed a discontent in allowing a green yard to remain unused, by stating that "when a green school ground is not used as an outdoor classroom, important opportunities to maximize the potential are lost. The space in effect, is left to speak for itself with students making sense of it of their own accord". (p. 42)

Notwithstanding outward appearance and state of the art environmentally sensitive buildings or an outstanding EE program, which in themselves are excellent and a great starting point for EE in schools, it is not enough to rely solely on them to speak for themselves in order to achieve a well-rounded EE for students. A green school in real sense should include solidification of its EE achievement, enriching its EE content and further fortifying its potential to improve the effectiveness of EE in such a school (Zhenya, 2004).

Teachers and educators promoting EE should not neglect any chance presented for teaching and learning. Learning in a top environmentally conscious building can be the basis for solid EE in any school. The advantages of having such a building as opposed to a less energy efficient one opens the door for several environmental concepts to be introduced, such as pollution or energy/resource conservation.

EE programs should be about developing understanding. Environmental issues enjoy a large amount of media hype, which may be a positive thing to use in

encouraging children to care actively for their environment, Baker (1991) noted that "their attitudes and actions should be the outcome of genuine knowledge about their surroundings, not the apocalyptic fantasies or political biases of adults" (p.2).

Hence, ensuring students' understanding in order to prevent false indoctrination should be one of the aims of any EE program. If "the future quality and stability of life on our planet depends on children developing the understanding necessary for making informed decisions about the environment" (Summers, Kruger & Childs, 2001, p.33), then ensuring that they are equipped with the right decision-making tool and accurate understanding should be the priority of any initiatives. To develop accurate understanding, it is vital to present correct facts and a balanced representation of varying viewpoints and theories (NAAEE, 2000).

Environmental issues at times do not demand a yes or no answer, they are not exact science and most times, decision making processes may be more complex than teachers and educators acknowledge. Teachers, in the bid to educate the students about the environment, should strive to lay adequate background information, and "help the students understand that environmental problems are not moral tales, even though they may appear that way in the newspaper" (Shaw, 2003, p. 64).

Students should be presented with accurate information to enhance their decision making and environmental analytical tools and the ability to examine issues from multi-epistemic perspectives and come to the best decisions with the information they are given.

EE programs should connect to the curriculum. As much as appropriate applause should be given to the various insightful innovations and initiatives designed to improve the teaching of EE, one cannot help but scrutinise initiatives that are floating or

not attached to any particular subject. The concern is that these initiatives may peter out with the initiator once they are no longer involved.

On the contrary, initiatives that are well grounded within a subject curriculum, with specific learning objectives may have the foundation that will propel them to last beyond their initiators. The importance of connecting an EE program to the curriculum was further supported by the Canadian Environmental Grantmakers' Network ―CEGN which posited that EE initiatives delivered in the school community should be grounded in environmental theory and principles linked to the curriculum and subject(s) (CEGN, 2006).

In a few of the EE initiatives mentioned earlier, (e.g., the Eco Regeneration Field Study), the activities are designed to be seamlessly blended with the lessons/subject and the curriculum that it becomes almost impossible to decipher where initiatives begin and the lesson stops. These are excellent initiatives worthy of emulation. The seamless blend with the lesson makes it a certainty that such an initiative will be part of the students' school year experience as opposed to those initiatives that require extra work by the teachers to modify and blend with daily lessons. In cases like this, the teacher may often ignore such an initiative and embrace a more familiar approach to their daily lessons.

Initiatives should be a complete package. All EE programs and initiatives should consist of a total package. In other words, it should be ready to use with complete instructions. Teachers have often cited lack of time to gather resources, prepare, sift through available information, and finally tie it all together, as hindrances to including some EE program's activities (Galloro, 2002, p. 21).

Teachers have also expressed their need for "experiential activities, with supplemental background readings and data, in which students must process information

and observations and draw and support conclusions" (Shaw, 2003, p. 60). The likelihood that an initiative would be used by teachers is highly dependent on the completeness of its package and the ease with which the teacher can implement it without the additional stress of finding background text materials for completing any programs' activity.

EE programs and initiatives should be based on sound environmental principles from related subjects. If environmental educators and teachers based their instructions on sound science and principles, maybe EE will receive less criticism and not be viewed as biased, controversial, or narrowly focused on advocacy rather than education (Hungerford, 2002a).

It is time that environmental educators begin to rethink the way EE is taught and the veracity of textbooks from which information is acquired and passed along to the students. Textbook or material with environmental exaggerations and information that had not been accurately verified should be eschewed. Baker (1991) admonished that "children's knowledge *of the* environment should be based on a sound grounding in science" (p.3), geography, environmental principles and other related subjects.

As observed by Shaw (2003), a number of textbooks used inaccurate science to deal with environmental topics, placing a greater emphasis on advocacy and unbalanced description of environmental issues. Shaw further highlighted how several textbooks treated various topics on environmental issues, steering students towards the complex and controversial topics (e.g., global warming and species extinction) without establishing adequate scientific background.

Although EE campaigns are necessary to inform the public at large, on the other hand, while it is a positive thing to use the frenzy and hype in EE to encourage the children to care actively for their environment, Baker (1991) noted that "their attitudes

and actions should be the outcome of genuine knowledge about their surroundings, not the apocalyptic fantasies or political biases of adults" (p. 2).

It is not enough to tell the pupils that the earth is warming up or that the polar ice is retreating or melting; this concept and claim is better understood when it is backed up by evidence or activities that enable students to investigate an issue or a claim. The traditional subject of geography can actually be used to teach this concept excellently with proof and evidence. A spatio-temporal analysis of aerial photographs and/or satellite imagery can be used in a lesson to back up this claim and remove the mysticism from the concept of global warming/polar ice melting for the pupils. The question remains, how many teachers can adequately employ this method or get the required resources to teach a spatio-temporal analysis?

Therefore, EE programs should be based on true and tested facts and where information evidence is not certain, there should be room left for students to undertake and enjoy scientific inquiry and be able to come to their own conclusion using available facts. Where it is not possible to come to a decisive conclusion, students should be taught that it is okay to be inclusive rather than jump to a false assumption.

EE programs and initiatives should include training and professional development for educators. For an initiative to gain a wide acceptance and go beyond the boundary of a single teacher's classroom, it should include professional development workshops that will introduce participating teachers to the basic environmental assumptions and principles supporting such a program, steps on how to go about achieving the initiatives objectives and a basic breakdown of program for teachers on how to complete each task and make meaning out of it.

The Report of the Working Group on Environmental Education (2007) recommended that both pre-service and in-service teachers get appropriate training necessary for the implementations of EE and related programs in schools. In their recommendation, they stated that the "faculties of education will make environmental education a teachable subject, providing all student teachers with training in environmental education, including the science behind environmental issues" while "professional learning experiences in environmental education will be provided for teachers and others working in education" (Report of the Working Group on Environmental Education, 2007, p. 15-16). These recommendations underscore the importance of including profession training as part of strengthening EE programs in schools.

EE programs and initiatives should be broad based, balanced and relevant. In EE, various factions have laid emphasis on different areas while ignoring other relevant areas. Baker (1991) observed that global warming, other atmospheric problems, pollution and trees are the issues given the greatest priority in EE. Wilke stated that "much of what is emphasized is outdoor education, sensitivity building, and ecological education" (cited in Hungerford, 2002b, p. 6). While Wilke agreed that these are important areas to focus on, he cautioned against a single minded concentration on them alone while omitting other environmental issues, investigation and environmental action skills. He further suggested that quite often, even when they are included, students' decisions on an environmental action may not be based on a comprehensive investigation of alternative consequences.

In some major initiatives discussed above, for example, the EcoSchools program, the focus is on recycling, energy reduction, waste minimization and school yard greening.

These are excellent topics, but the environment and environmental issues are not limited to these topics alone and as much as it is necessary to address them, they are not monolithic but a part of an environmental complexity that should never be ignored.

Hence, EE initiatives should strive for the inclusion and connection of multiple environmental issues or be readily expandable whenever an educator considered it fit to add other relevant environmental topics. This is especially relevant ―where an EE initiative is to be used as board-wide or province-wide programs.

EE programs and initiatives should be transferable and adaptable. Environmental concepts are the same, with slight modifications from region to region as a result of politics or varying environments and environmental practices. A well configured EE initiative should be transferable, that is, possessing the ability to be used in other identical circumstances albeit with minor modifications.

Borrowing an initiative to use for another region will prevent the reinvention of EE wheel common in some parts of the world ― example, Canada where national integration of EE is lacking across provinces and territories, with materials not being translated and the EE wheel getting reinvented region by region (Fawcett, 2009). Also, in a situation where an educator desires to modify a program by adding other relevant topics to the material presented, a program and program material should be adaptable (NAAEE, 2000) to a new situation.

EE programs and initiatives claim should be backed up with verifiable evidence. The NAAEE (2000) in its Environmental Education Material Guideline for Excellence caution that for material from programs to be relevant, claims of learning outcomes should be substantiated by evidence and not just based on anecdotal comments from program initiators and users. Hence, in addition to popular use and buzz surrounding

a program, success claims by EE programs should be authentic and not just by word of mouth only.

Shaw noted that a general tilt towards gloom, exaggeration, and advocacy tend to permeate EE (Shaw, 2003; Fawcett, 2009). The sad part is that the gloom does not start and end in schools and textbooks, but extends to homes and society through eye catching media documentaries and well worded news (Shaw, 2003). This in itself should not be the sole purpose of EE, but rather an analysis of facts to determine an issue.

EE programs and initiatives should involve and be developed by relevant professionals. In order to ensure consistency of terms and principles, the CEGN (2006) recommended that "formal environmental education initiatives should be: "written by someone with educational expertise" (p.8). As stated previously, it may be great to have a language teacher champion the cause of environmental education programs, but when it comes to the development of EE initiatives and programs, it becomes necessary to involve relevant subject teachers—teachers that have a significant amount of environmental concepts embedded in their own curriculum.

Furthermore, professionals from other relatable discipline should write EE programs and materials in order to ensure a balance presentation of materials and views (NAAEE, 2000).

EE programs and initiatives should have measurable outcomes. EE initiatives should be results-oriented with measurable outcomes for participants. EE programs and initiatives' effect on knowledge, attitude, physical manifestation and the impact of EE initiative should be assessable to ensure effective feedback and necessary future program modification. The NAAEE (2000)'s guideline for excellence in EE suggests that a program should include assessment materials for determining students' "baseline

understanding, skills, and concept at the beginning" (p. 18) through a variety of means so that the overall learning and gain in EL can be monitored.

EE programs and initiatives should be cross curricular. NAAEE guideline for excellence in EE suggests that materials used in EE programs should be interdisciplinary and all subjects discipline embedded in each lesson clearly listed (NAAEE, 2000) In a conversation with Hungerford, Simmons, the Director for National Project for Excellence in EE cautioned that "until we begin to thoughtfully consider the connections between what we do, environmental education will forever be doomed to being episodic and marginalized" (Hungerford, 2002a, p. 6).

Some Issues in EE Programs

EE programs and initiatives abound and it seems like EE programs have come to stay. Although some dissatisfaction may still remain among educators concerning the gap between the overwhelming awareness that is being placed on EE and the training that exist in the universities for teachers of EE, the outlook, in terms of awareness and growth of new and innovative EE programs is significant. As noted by several authors (Cinquetti & de Carvalho, 2007; Fawcett, 2009; Lin, 2002), there is a shortage of teacher education programs in EE, which have resulted in a teaching force that lacks the necessary proficiency to realise the aims of EE.

Consequently, it is not sufficient to develop excellent EE programs/initiatives and materials for classroom use when teachers are not trained to handle such challenges. In addition to top notch programs and initiatives, plans and efforts must be made to educate the teachers that will deliver the materials. Several researchers recommend bridging the training gap by strengthening EE at college level (Hungerford, 2002a), provide

environmental educators professional development and organise relevant workshops involving hands on activities (Dyment, 2005b).

Also, there is the difficulty of integrating EE across academic disciplines. This prospect has been viewed as challenging since courses for secondary teacher candidates tend to reflect subject boundaries, thus challenging *i*nterdisciplinarity (Lin, 2002; National Environmental Education Foundation, 2008). Also, although literature revealed that several researchers support teaching EE across disciplines and adapting a multidisciplinary approach to EE and EE programs (State Education and Environment Roundtable – SEER, 2000; UNESCO-UNEP, 1985), others have challenged the authenticity of infusing EE programs across curriculum (Puk & Behm, 2003).

Prospects of Environmental Education Programs

One of the major barriers to the implementation of EE programs in schools has been attributed to lack of skill, training and confidence on the part of the teacher to execute some of the EE programs and apply it to their lessons (Dyment, 2005a; Galloro, 2002; Lin, 2002; Sharp & Breunig, 2009; Shaw, 2003). In order to bridge the training gap, Bora Simmons in an interview with Hungerford (2002) noted that "we need people to strengthen environmental education studies at the college level" (p. 6). This advice of strengthening EE programs at college level is also supported by other researchers in Canada (e.g., Dyment, 2005a; Lin, 2002).

Workshops, professional development programs, in-service EE courses, etc. are all necessary if EE programs and initiative are expected to forge ahead. In order to deal with the huge amount of information coming in as a result of the development of new EE programs, it has become obvious that hands on activity workshop for the teachers also be

a part of any initiative to ensure proper concept understanding and uniformity across schools during implementation.

The Concept of EL

As highlighted in the Tbilisi Declaration[7] (UNESCO, 1978), the goals of EE are to: Develop a populace that has a clear awareness, and concerns about economic, social, political and ecological interdependence in urban and rural areas; and provide them with the opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment in order to create new positive patterns of behaviour from individuals, groups and society as a whole towards the environment (p. 15).

These goals are further emphasized and expanded in the Tbilisi Declaration's components of EE objectives outlined below:

> **Awareness** – to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems.
> **Knowledge –** to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of the environment and its associated problems.
> **Attitudes** – to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.
> **Skills** – to help social groups and individuals acquire the skills for identifying and solving environmental problems.
> **Participation** – to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems. (UNESCO, 1978, p. 15)

[7] A leading document in environmental education.

The definition and goals of EE outline the skills, plans, and processes necessary for developing EL. As stated previously, EL is a direct outcome of EE. It is expected that the objectives of EE be reflected in an environmentally literate individual. An environmentally literate individual, defined in the executive summary of the environmental literacy assessment framework as:

> Someone who, both individually and together with others, makes informed decisions concerning the environment; is willing to act on these decisions to improve the well-being of other individuals, societies, and the global environment; and participates in civic life. (Hollweg et al., 2011, p. 1)

This portrayal identifies an environmentally literate individual to possess, albeit to varying degrees the following in order to exhibit the above characteristics:

- the knowledge and understanding of a wide range of environmental concepts, problems, and issues;
- a set of cognitive and affective dispositions;
- a set of cognitive skills and abilities;
- the appropriate behavioral strategies to apply such knowledge and understanding in order to make sound and effective decisions in a range of environmental contexts. (Hollweg et al., 2011, p. 1)

Also, this definition portrays the principal elements of EL—the cognitive (knowledge and skills), affective, and behavioral components—as both interactive and developmental in nature. This resonates and corroborates Roth's observation that EL is not binary but a continuum from zero aptitude to advanced skills (Roth, 1992, p. 25). In other words, a person's EL over the continuum, changes over time. An individual is not either environmentally literate or illiterate but will possess, at any point in time, a certain degree of EL.

Components of EL

Major components of EL are knowledge, attitude, motivation, cognitive ability, skills, willingness to act, behavior towards the environment. These strands, the goals of EE and direct outcome of EL are deemed measurable and predictors of an individual's level of EL (Milfont & Duckitt, 2010; Morrone, Mancl & Carr, 2001; Swanepoel et al., 2002; Volk, & McBeth, 1997). These studies have assessed EL using these domains. They have been able to determine, using students' performance, baseline of EL or whether a program has made significant contribution in improving students EL. The level of performances in these strands and domains are predictors of EL continuum (Roth, 1992; Hollweg et al, 2011).

Measureable components in EL assessment. Several components in EE have been used in various researches to assess EL. These components were often used in combination or singularly to assess EL. From the literature, these components are numerous and at times may present confusion as to what really needs to be included in an EL assessment. The following have been used in different studies:

1. Ecological or environmental knowledge – including indigenous species. (Bogner, 1999; Chu, et al., 2007; Culen & Mony, 2003; Disinger, 1997; Marcinkowski, 1997; Maloney, Ward & Braucht, 1975; Marshall, 1997; McBeth, 1997; Meyers, 2009; Negev et al., 2008; Rovira, 2000; Swanepoel et al., 2002; Walsh-Daneshmandi & MacLachlan, 2006; Ruiz-Mallen et al., 2009),
2. Ethical awareness (Venkataraman, 2008),
3. Environmental awareness – knowledge (Culen & Mony, 2003; Kollmus & Agyemann, 2002; Rovira, 2000; Swanepoel et al., 2002),

4. Affect (Disinger, 1997; Maloney, Ward & Braucht, 1975; Marcinkowski, 1997),
5. Affective Disposition (Marcinkowski, 1997),
6. Cognitive skills (Chu, et al., 2007; Culen & Moni, 2003; Disinger, 1997; Marcinkowski, 1997; Marshall, 1997; McBeth, 1997; Meyers, 2009),
7. Environmental values (Kollmus & Agyemann, 2002; Marshall, 1997),
8. Attitudes towards the environment (Chu, et al., 2007; Hsu, 2004; Kollmus & Agyemann, 2002; Marcinkowski, 1997; Milfont & Duckitt, 2010; Maloney, Ward & Braucht, 1975; Negev et al., 2008; Swanepoel et al., 2002; Walsh-Daneshmandi, & MacLachlan, 2006),
9. Environmental motivation (Marcinkowski, 1997),
10. Environmental involvement and endeavours (Marshall, 1997; Swanepoel at al., 2002; Kollmus & Agyemann, 2002),
11. Commitment to act in favour of the environment– Verbal and actual (Maloney, Ward & Braucht, 1975; Hsu, 2004),
12. Environmental behaviour (Chu, et al., 2007; Disinger, 1997; Hsu, 2004; Marcinkowski, 1997; Negev et al., 2008),
13. Environmental/personal responsibility (Marcinkowski, 1997),
14. Evaluation of environmental issues (Culen & Mony, 2003),
15. Environmental sensitivity (Hsu, 2004);
16. Locus of control (Hsu, 2004; Kollmus & Agyemann, 2002; Marcinkowski, 1997),

EL Assessment Framework

Although combining every one of these components in an EL assessment task is daunting, they form the bases of what is to be assessed in EL. While it appears that there are several of them, a closer examination of all the concepts show that they fall under one of four domains of EL outlined in the recent framework for assessing EL by Hollweg et al., (2011). This framework eliminates the task of finding the necessary combination of components to include in an EL assessment and summarised the components of EE into domains of a) Environmental competencies, b) Environmental knowledge and awareness, c) Dispositions towards the environment and d) Environmentally responsible behavior.

Environmental knowledge and awareness. This component of EL provides data on student's foundational knowledge of the environment and the ecosystem. This section may use multiple choice questions, list or short answer type items. The knowledge section may contain: Physical and ecological system, environmental problems and issues associated with them (biophysical impacts of threats and social political controversies surrounding problems), and environmental problem solving and action strategies and issues associated with them (Hollweg et al., 2011; Marcinkowski, 1997; Morone, Mancl & Carr, 2001; Mony, 2002; Wisconsin Center for Environmental Education, 1997).

Environmental knowledge is broad knowledge, in the sense that it is not limited to one particular discipline. In order to be environmentally competent, a comprehensive foundational knowledge of ecological concepts and principles, environmental problem and problem-solving and action strategies and issues associated with them is not sufficient but in addition, cognition in the social sciences which may include history, physical and cultural geography, political science, sociology, psychology and economics are considered the foundation knowledge outcome of EE (Marcinkowski, 1997).

The knowledge components of an EL assessment may be comprised of items that shed light on students' knowledge of physical and ecological system—like relations in ecosystems, energy transfer and cycles of matter in ecosystems and interactions and interrelationships among major systems.

It can also include Earth's surface processes, the effects of human activities on climate change, agriculture, transportation, environmental problems and issues associated with them (biophysical impacts of threats and social political controversies surrounding problems), spatio-temporal context (change over space and time) of social and environmental issues, environmental problem solving and action strategies and issues associated with them, various forms of citizens participation and services in the community intended to improve the environment (Hollweg et al., 2011; Marcinkowski, 1997).

Generally, in EL assessment, the aim is to account for what an individual knows about:

1. General environmental, ecological principles and ecological systems,
2. Knowledge of the sociopolitical and socio-cultural systems that influence and shapes the environment, for example; agriculture, transportation, legal system as well as the spatio-temporal context in which they have developed and currently functions.
3. Knowledge of various strategies for addressing and proffering solutions to environmental issues and
4. Knowledge of national and global environmental issues (Hollweg et al., 2011).

Also, in the case of an assessment geared toward determining the effectiveness and impact of an EE program, knowledge of the principles emphasized by the program

may be of interest. Environmental knowledge is a key component of EL. Environmental knowledge will influence an individual's environmental competencies and disposition toward the environment.

Environmental competencies. Hollweg et al. (2011) defined environmental competencies as "clusters of [environmental] skills and abilities that may be called upon and expressed in real-world and assessment settings for a specific purpose" (p. 3-7). An environmentally competent can perform these environmental clusters of skills and draw upon them consistently in real world for specific purposes. Furthermore, Hollweg and Colleagues stated that environmental competency may require "the ability to discriminate between features of environmental problems and issues in those sources; the ability to judge the validity of information and recognize value perspectives apparent in those sources; and the ability to determine the status and relevance of that issue" (p. 3-7).

Environmental competencies address students' proficiencies in identifying, analysing, evaluating potential solutions to, proposing and justifying actions that address environmental issues (Hollweg et al, 2011; Marcinkowski, 1997). Competencies include cognitive skills like "skills for investigating environmental problems and issues, including identification, analysis, and evaluation; and skills for dealing with action strategies, including their appropriate selection and planning, implementation, and evaluation of discrete action" (Marcinkowski, 1997, p.168). Marcinkowski described the affective skills as reflective of "valuing, organising values into system, integrating values into a world view of ethics, and acting according to these" (p. 168).

Hierarchically, Hollweg et al.'s (2011) framework list identify environmental issues as the first step in competence acquisition, then step two is the ability to analyse environmental issues, then evaluate potential solutions to environmental issues and finally

propose and justify actions that address the environmental issue. Conversely, it may be argued that in order to competently analyse and propose solution to an environmental issue, one may need to be able to identify it first as an issue.

Dispositions and attitude towards the environment. Environmental dispositions are considered one's environmental outlook. Dispositions are viewed as important determinants of behaviors, both positive and negative, toward the environment (Hollweg et al, 2011). An individual's dispositions and attitude are also an indication of their level of EL and it is influenced by their environmental knowledge. Dispositions and attitudes also influence an individual's environmental competency in terms of how they analyse, evaluate, propose and justify actions that address environmental issues.

According to Hollweg et al. (2011), environmental disposition comprise the following: environmental sensitivity, environmental concerns, attitude and worldview, personal responsibility, self-efficacy, motivation and intentions. A person's disposition and attitude include how that individual responds to environmental issues, their interest as it pertains to the environment and issue, sensitivity, environmental affect or their general affection towards the wellbeing of the environment.

Also, environmental disposition encompasses individuals willingness and intention to act, responsibly or the ability to take responsible actions that benefits the environment, and finally, their locus of control which is their "perceived ability to bring about desirable outcomes in the world through one's action" (Marcinkowski, 1997, p. 183).

Environmentally responsible behavior. Hollweg et al (2011) conceptualised environmentally responsible behavior as

> "The expression of knowledge, dispositions, and competencies within a context...within the environmental education field and in a variety of associated fields…e.g. environmental behavior, pro-environmental behavior, ecological behavior… Each of these refers to behaviors intended to have a positive impact on the environment by targeting problems and issues, as well as those that actually have a positive environmental consequence" (p. 3-12).

The Interconnectivity of the Assessment Components

The conceptual framework of Hollweg et al. (2011, p. 3-2) showed a summary of the processes that an El assessment might take. EL assessment seeks to measure students' level of environmental knowledge and awareness from a local and/or global context. Various competencies are required (e.g., skills inherent in students necessary for identifying, analyzing, evaluating environmental issues). EL assessment also seeks to establish students' competencies and capabilities at proposing and justifying actions that address environmental issues.

The framework also highlighted the interconnectivity present in the EL assessment process. From the framework; it is indicative that students cannot demonstrate environmental competencies without environmental knowledge and awareness. It also establishes that attitudes and disposition towards the environment (negative, positive or passive) are also influenced by environmental knowledge and awareness. Likewise, overall knowledge, awareness, disposition and attitude towards the environment will influence how well each competency and skill sets is applied at any given context.

Continuums of Environmental Literacy

Roth (1992) grouped the degree of EL into an EL continuum where he outlined three major ranges: Nominal, functional and operational EL. In Roth's work on EL, he

ranged competencies in EL from inability to sophisticated. Roth's work on EL continuum can be utilised for EL data interpretation and for grouping an EL assessment outcome into nominal, functional and operational literacy. Individual at each place in the continuum of EL will have acquired a certain amount of knowledge, affect, skill and behaviour which can be identified by the way they approach and deal with an environmental issue. To highlight the characteristics of each continuum, Roth's (1992) description of the continuums is summarised in the following sections.

Nominal literacy is the minimal level of literacy on Roth's EL continuum. A person at this EL level is still at the emergent stage of EE. According to Roth (1992), a nominally literate individual is:

> Able to recognize many of the basic terms used in communicating about the environment and able to provide a rough, if unsophisticated, working definition of their meaning … Persons at the nominal level are developing an awareness of and sensitivity toward the environment along with an attitude of respect for natural systems and concern for the nature and magnitude of human impacts on them. They also have rudimentary knowledge of how natural systems work and how human social systems interact with them (p. 20).

Nominally literate knowledge level. Roth indicated that individuals that fall within the first continuum of EL, that is, nominally literate individuals, will be conversant with the basic knowledge of the component of living and nonliving things in the ecosystem, the system that governs them, the basic types of nature of human and nature interactions, the fundamental components of the societal systems and capable of providing basic examples of the preceding principles (Roth, 1992).

Nominally literate affect level. For this component, Roth pointed out that an individual who is nominally environmentally literate will display affective basic

sensitivity and empathy for the beauty of both nature and society and perception of the simple points of conflict between nature and society (Roth, 1992).

Nominally literate skill level. The environmental skills for the nominally literate are budding. The nominally literate can identify and define basic environmental problems, recognise issues surrounding a problem and proffer some solution to the problem (Roth, 1992).

Nominally literate behaviour level. Finally, the nominally environmentally literate individual can demonstrate some coping behaviour for environmental issues, shows familiarity with organisations and activities that seek to maintain environmental quality (Roth, 1992).

Functional literacy. According to Roth's EL continuum, at this level of EL, a person has grown beyond the developmental stages of environmental knowledge and has gotten into the category of displaying wider knowledge and understanding of nature and the key interactions between human and the natural systems.

These individual also show awareness of and concern for the negative interactions between the human and the social systems in relation to an environmental issue (at least one or more issues). They have also developed the skills to analyze, synthesize, and evaluate information about these issues using various primary and secondary sources of information and ideas. They can also assess a number of problems or issues based on correct evidence, their personal values and environmental ethics. Finally, a functionally environmentally literate can communicate their verdicts and feelings to others when it comes to analysing an environmental issue (Roth, 1992).

Functionally literate knowledge level. The functionally environmental literate has acquired all the knowledge of the nominally environmentally literate, and in addition, has

an understanding of a number of ecological, economic, geographic, religious, educational and political processes with the outcome of nature and human systems interactions like population dynamics, ecosystems, biogeochemical cycle, resource distribution and issues, creative and critical thinking, etc. (Roth, 1992).

Functionally literate affect level. The functionally environmentally literate individual have the ability to identify, feel concern for the society and the environment, display a sense of environmental stewardship, and respect for private and public properties (Roth, 1992).

Functionally literate skill level. The functionally environmentally literate will demonstrate basic skills for environmental issues analysis. They can investigate environmental problem using secondary resources/plan to identify environmental matters; evaluate the source of information; use various perspective to analyse various environmental issues; identify alternative solutions; able to analyse risk; have the ability to think systemically; critically and creatively forecast, work with others, act, judge and articulate personal environmental values (Roth, 1992).

Functionally literate behaviour level.

The functionally environmentally literate will exhibit behaviours like taking actions to benefit the environment based on the best available knowledge, participating in individual and/or group actions through Eco management, legal actions, political action, persuasion, and consumerism (Roth, 1992).

Operational literacy. According to Roth (1992), the individual in this category has moved beyond the functionally environmentally literate in terms of the depth and breadth in skills, knowledge and understanding to regularly evaluate the impact of environmental issues, choose alternative actions, understand the consequences and impact

of actions, take decisions that are positive towards the health of the environment, and remediates for degradation.

For the operationally environmental literate, the characteristics of the functionally literate have become a habit. Thinking about the welfare of the environment has become a second nature and intertwined with their daily living.

Operationally literate knowledge level. An individual that has attained this level of literacy is aware and sensitive to the total environment, is motivated to act and participate in its' improvement programs.

This individual has reached the state where they have a sense of personal responsibility for the wellbeing of the environment by recognising impacts of their personal behaviour, accepts personal responsibility for impact and willing to correct and avoid negative impacts, has a personal environmental ethics, and is willing to curtail personal temporary enjoyment for long term (Roth , 1992).

Operationally literate affect level. The operationally literate affect level individual is aware and sensitive to the total environment, is motivated to act and participate in improvement programs and has a sense of personal responsibility for the wellbeing of the environment by recognising impacts of their personal behaviour.

Also, this individual accepts personal responsibility for impact and willing to correct and avoid negative impacts, has a personal environmental ethics, and is willing to curtail personal temporary enjoyment for long term public good among other things (Roth, 1992).

Operationally literate skill level. The operational environmental literate uses scientific inquiry and skills to forecast, plan and think ahead, has the ability to connect

and link issues, recognise value and make value analysis, uses primary and secondary information, and separate facts from opinions (Roth, 1992).

Operationally literate behaviour level. Individuals with this competency demonstrate leadership in working towards resolving environmental problems, evaluating actions with respect to impact on human life and the environment, maintains social and biological diversity, constantly r/evaluating cultural values, able to make "decisions based on beneficence justice, stewardship, prudence, cooperation, and compassion" (Roth, 1992, p. 34).

Previous Studies on EL Assessment

Very little research has been conducted about the assessment of EL in Ontario schools or in Canada. More generally, there is ample evidence of EL assessment and evaluation in North America and around the world. Studies assessing EL in the literature generally fall under one or more of the following headings: 1) studies that assessed the effectiveness of EE programs for enhancing EL, 2) studies on EL to Establish EL baseline for students or teachers, 3) studies on EL Assessment to determine the relationship between EL components as predictors of responsible environmental behaviour and 4) Studies conducted to assess EL in order to develop or test the validity, reliability and usability of an instrument for measuring and assessing EL.

Studies assessing the effectiveness of EE programs for enhancing EL. This type of studies assessed the effectiveness of EE programs for fostering EL or assessment of EL as an outcome of EE programs and initiatives (Bogner, 1999; Culen & Mony, 2003; Dimopoulos et al., 2008; Hsu, 2004; Moody et al., 2005; Rovira, 2000; Roberts, 2008; Ruiz-Mallen et al., 2009; Walsh-Daneshmandi, & MacLachlan, 2006; Wang,

2009). In these studies, the change that occurred in EL components (knowledge, attitudes, behaviour, skill or awareness) were measured.

Assessment usually followed a period of exposure to an EE course or program. These studies embrace a pre and post treatment format. In most instances, outcome in these studies are usually positive and there is significant improvement in one or more components of EL. In an analysis of three types of research in EE, Hart and Nolan (1999) observed that in most cases, "the environment-related experience was found to have a positive effect on knowledge, attitude and predisposition to action or responsible environmental behaviour" (p. 7).

Hart and Nolan (1999) also noted that "attitudes of concern about the environment appear to be increasing" (p. 8), but they were concerned that there was little understanding about what this [increase in attitude] implied. Hart and Nolan further critiqued studies of this nature by stating that while they may indicate a gain in the components of literacy, several of them were usually blurry on specifying the exact meaning and content of the EL components which they have measured.

Studies on EL to establish EL baseline for students or teachers. Here, studies are done to assess EL or establish EL baseline for students or teachers (Alp, Ertepinar, Tekkaya & Yilmaz, 2006; Chu, et al., 2007; Makki, AbD-El-Khalick & Boujaoude, 2003; McBeth et al., 2008; Negev et al., 2008; McBeth & Volk, 2010; Shin, et al., 2005; Swanepoel et al., 2002; Wisconsin Center for Environmental Education, 1997). These studies are conducted to determine the level at which students are functioning and at times; they act as a baseline for the start of a new EE program. McBeth and Volk (2009) observed that studies that established baseline provided future research and/or EE programs a benchmark against which to measure current and future EE efforts.

Conversely, the apparent weakness in a baseline study may lie in the fact that EL has different measurable components, and the components assessed in each study may differ. Hence, a standardized EL instrument may be necessary for the result of baseline studies to be comparable across studies. Subsequent research that purpose to use baseline studies may have to use same instrument in order to have a basis for parallel comparison.

Studies on EL Assessment to Determine the Relationship between EL Components as Predictors of Responsible Environmental Behaviour. The third category comprise of studies on EL Assessment conducted to determine the relationship between EL components as predictors of responsible environmental behaviour—REB (Hsu & Roth, 1999; Kollmuss & Agyeman, 2002; Morrone et al., 2001). For example, studies conducted to determine the relationship between EL components may look at how much influence environmental knowledge has on a person's environmental attitude or behaviour.

Studies conducted to assess EL to Develop or Test the Validity, Reliability and Usability of an Instrument for Measuring and Assessing Various Components of EL. The fourth category of studies are one with the purpose to assess EL in order to develop or test the validity, reliability and usability of an instrument for measuring EL (see Chu, et al., 2007; Leeming & Dwyer, 1995; Maloney, Ward, & Braucht, 1975; McBeth, 1997; Milfont & Duckitt, 2010; Moody, et al., 2005; Walsh-Daneshmandi & MacLachlan, 2006). A number of useable EL instrument has been developed by researchers. Examples include, MSELS (Hungerford, Volk, McBeth, & Bluhm, 2009), Ecological Attitudes and knowledge Scale (Moloney, Ward, & Braucht, 1975), Environmental Attitude Inventory (Milfont & Duckitt, 2010), Metric for Testing Group

Differences in Ecological Knowledge Component of EL (Morrone et al., 2001) and Environmental Awareness Scale (Uzun & Saglam (2005).

Although the Tbilisi declaration (UNESCO, 1978) recommended awareness, knowledge, attitude, skills and participation as main components to be assessed in EL, the EL variables assessed in the literature varied and various authors combined or modified these components. The following are some combinations of the EL components that have been used in various studies.

- Knowledge, values, skills, and participation (Marshall, 1997),
- Knowledge, awareness, attitude and participation (Swanepoel et al., 2002),
- Knowledge, attitude, behaviour, and skills (Chu, et al., 2007),
- Knowledge, issue awareness, knowledge of skill, and evaluation of environmental issues (Culen & Mony, 2003),
- Knowledge, skills, affect and behaviour (Disinger, 1997),
- Awareness, knowledge, attitude, skills and participation (Hungerford, Peyton &Wilke, 2005),
- Cognitive knowledge, affect, cognitive skills, and behaviour (McBeth & Volk, 2010).

While no rule of thumb exists in determining the EL components to include in an EL assessment, McBeth and Volk (2010) stated that common features in an EL assessment framework include reflection of at "least four of the Tbilisi categories of objectives, namely knowledge, affect, skills, and participation (i.e., behaviour)" (p. 56) and addressing at least three major thematic emphases apparent across the history of EE within the country. Notwithstanding the combination of variables chosen for an EL

assessment, or the exclusion of one component over the other, it does not necessarily signify non-assessment of others since components are intricately linked and a clean line of separation cannot easily be drawn between them.

Also varying from study to study are the research methodologies employed. The three broad groups of research methodologies were utilized in the literature for El assessment studies:

- Quantitative (e.g., Alp, Ertepinar, Tekkaya, & Yilmaz, 2006; Chu et al., 2007; Makki, AbD-El-Khalick, & Boujaoude, 2003; McBeth et al., 2008; Negev et al., 2008; McBeth & Volk, 2010; Shin et al., 2005; Swanepoel et al., 2002; Wisconsin Center for Environmental Education, 1997),
- Qualitative (e.g., Roberts, 2009)
- Mixed methods (e.g., Rovira, 2000; Ruiz-Mallen et al., 2009; Walsh-Daneshmandi, & MacLachlan, 2006).

Quantitative methods were the most common methods used in the literature review for assessing EL. The least common was qualitative methods although Lidstone and Stoltman (2008), cited it as having become the favoured design in EE as a result of being viewed "as a more manageable paradigm for the independent researcher or research team" with smaller sample sizes and ability to provide "specific information about a research question based on the responses of the subjects" (p. 196).

The studies employing a mixing of both methods extolled its' advantages in EL assessment as being capable of providing a methodological completeness (Ruiz-Mallen et al., 2009). This completeness is also reflected in Johnson and Onwuegbuzie (2004) claim that mixing methods "can provide a stronger evidence for a conclusion through the

convergence and corroboration of findings" (p.21), since the researcher can use the inherent strength of one method to alleviate the weakness in another.

A counter argument is that the mixing of methods in EE research should be approached with caution and the lure of mixing methods should be resisted (Dillon &Wals, 2006). They advised that in choosing methodologies, the ontological, epistemological and axiological ramifications of the chosen methodology should be considered with inquiry driven by questions rather than the researchers preferred methods or methodologies (Dillon &Wals, 2006).

Assessment of EL

EL can be assessed using either authentic and traditional assessment methods or a combination of both methods (Marcinkowski, 1997; Meredith, et al., 2000). "Authentic assessment involves learners in tasks that *are* meaningful, worthwhile**,** and make use of higher order of thinking skills and a broad range of knowledge" (p. 37). It can also take various forms, like observation of learners' behaviour, face-to-face interview, concept mapping, prior knowledge chart, performance assessment, portfolio, projects/investigations and presentations. It has the added advantage of being far reaching and can be used not only as a valuation technique, but also a learning tool as learners become active, rather than passive participant test takers (Meredith, Et al., 2000).

In situations where it is not possible to appropriate one form of authentic assessment, a traditional form of may be more suitable. Traditional assessments are formal tests given out as a questionnaire or survey (Meredith et al., 2000).

Traditional forms of assessment offer some advantages over the authentic assessment in that they may yield numerical scores and provide data that can be used for comparison across learners. It can also be used to assess a larger sample since they take

less time to administer. Overall, Meredith et al. (2000) advised that any assessment technique used should be compatible with the program type and learners involved.

EL Assessment Instrument

In order to assess EL, it is important to use a tool that encompasses all aspects of EE and the basic guidelines for teaching EE. Several scholars (Hungerford, Volk, McBeth, & Bluhm, 2009; Morrone et al., 2001; Swanepoel et al., 2002) have developed instruments for assessing EL either at the elementary, secondary or college level and other EE researchers (Culen & Mony, 2003) have used existing instruments to assess EL for EE programs.

EL assessment includes multiple components (Wang, 2009), which may comprise any or all of the following: awareness, knowledge, attitudes, skills and participation (UNESCO, 1978). The multiple components in EL presents some complexities that require a carefully thought out plan and instrument that includes items from the four goal levels for EE curriculum: ecological foundations, conceptual awareness—issues and values, investigation and evaluation, and environmental action skills—training and application (Hungerford, Peyton, & Wilke, 1980) if EL is to be assessed in its totality.

CHAPTER 3

RESEARCH METHODOLOGY

Restatement of Research Purpose

The main purpose of this research is to assess the impact of EE programs on students' EL in Ontario schools (with major focus on the EcoSchools program). To do this, I investigated the level of students' involvement in the EcoSchools program and their EL The focus of the study was to determine the impact of the program on students' EL, the students' level of EL, their level of participation and awareness of the EcoSchools program. I also analysed the EcoSchools teacher coordinator perspectives on the effectiveness of program for EL acquisition.

In the previous chapter, I provided a review of literature on EE programs and specifically the EcoSchools program, EL assessment and Roth's classification of EL into continuum. In this chapter, I summarised the methodology used for this research by providing an overview of the research design, sampling procedure, data collection and analysis, and the ethical considerations.

Research Questions

This research addressed the following guiding questions:

1. What is the EL level of students in the surveyed school board (using Roth's EL continuum and Ontario grading levels)?
2. Do students in schools with EcoSchools program demonstrate a higher level of EL compared to students in schools without EcoSchools program?
3. Do students in schools (with gold, silver or no level of EcoSchools certification) display different levels of EL?

4. Do students in county schools and students in city schools display different levels of EL?
5. Do students' EL scores vary across grade (7-12)?
6. How aware of the EcoSchools program are students in the schools with the EcoSchools program?
7. Does students' level of awareness (of the EcoSchools program) vary with the level of their school's EcoSchools' certification (gold, silver or no certification)?
8. How do students rank the EcoSchools program as a source of environmental knowledge?
9. How do the EcoSchools teacher co-ordinators' perceive the EcoSchools program (what they did, what was great, and what needed to change)?

Research Methodology and Justification

As participants in the complex field of education, researchers are faced with an assortment of methodologies and philosophical positions (Pallas, 2001), and several uncertainties arise as the decision is made to select the most appropriate method to help in getting to the goal. In the words of Dillon and Wals (2006),

> Methodological considerations involve examining positioning and tensions in research ontologies, epistemologies and axiologies. Ontology looks at what we're dealing with (the *what*)—the nature of reality— we are 'researching', for instance, people's knowledge, attitudes, the words people use… Epistemology refers to how we make knowledge (the *how*)—for example, do we look for patterns and themes in what people say in answer to our questions, do we give people tests, or do we watch what people do and infer their thoughts from their actions? Axiology relates to ethical considerations and our own philosophical viewpoints (the *why*)—such as, do we take a

> positivistic stance, use feminist epistemologies, involve participants as researchers? (p. 550)

Navigating through several methodologies and methods available in educational and EE research, and contemplating the most efficient and effective way to approach this dissertation, the words of Russell et al. (2000) shed light on the uncertainties that accompany the choice of a particular research design over the other:

> Many currents stir and animate the waters of Canadian environmental education. We travellers [EE researchers] must pick and choose among them, depending on the vantage points we seek, the pace we deem desirable, and the destination we have in mind. The routes we wish to follow are seldom direct. They twist and turn while currents far more powerful than our canoes carry us along. Choices must be made....There is no single correct way of proceeding and what we propose now is simply to pause for a moment to contemplate some of the directions that lie ahead. (p. 203)

Given this research ontology, epistemology and axiology, a mixed method design was chosen. Mixed methods design "is a procedure for collecting, analysing, and "mixing" both quantitative and qualitative research and methods in a single study to understand a research problem" (Creswell & Plano Clark, 2007 in Creswell, 2008, p. 552).

While EL can be assessed using qualitative, quantitative or mixed methods (see Rovira, 2000; Ruiz-Mallen, et al., 2009; Hart, 1996), EL assessment research, like other educational research, may take a variety of shapes depending on the perspective of the research/er and the research questions to be answered (Dillon & Wals, 2006). Dillon and Wals advised that "inquiry should be driven by questions, not by preferred methods or even methodologies" (p. 558) when it came to choosing a particular methodology.

A mixed method design was chosen because of its inherent ability and strength to combine the advantages of data from both methods like the qualitative aspect of the

research providing more insights into the quantitative results. It is not always enough to have numbers alone but also meaningful and insightful explanation on how those numbers came to be. Mixed methods was chosen to provide further understanding of students' performance on the EL test and the various observations on the visibility and students awareness of the EcoSchools program.

The mixed method design embraced for this research was the embedded design where the quantitative methodology was primary and central to the research purpose and objective while the qualitative research design provided secondary data which were used to support, supplement and further provide insights into the quantitative results as shown in *Figure* 3.1. Chapter 3 is summarised in *Figure* 3.2.

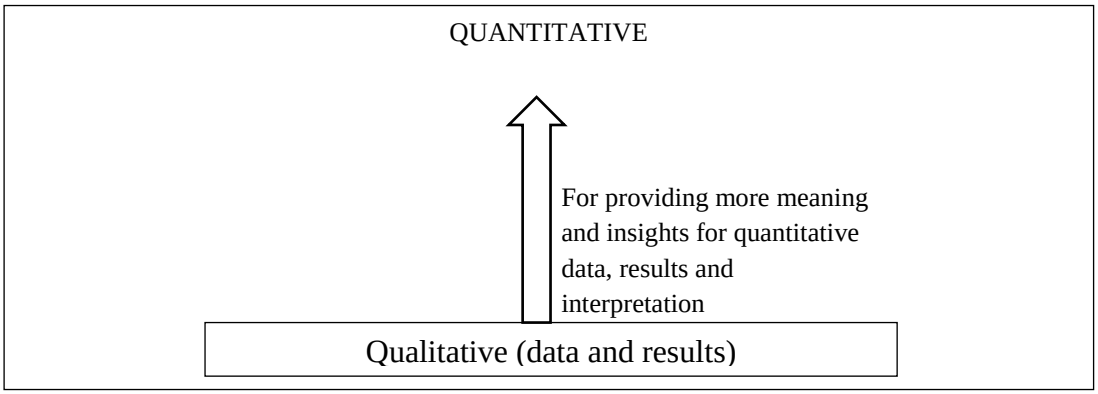

Figure 3.1. Embedded Mixed Methods Design —Schematic representation of the research design. Adapted from Creswell, 2008.

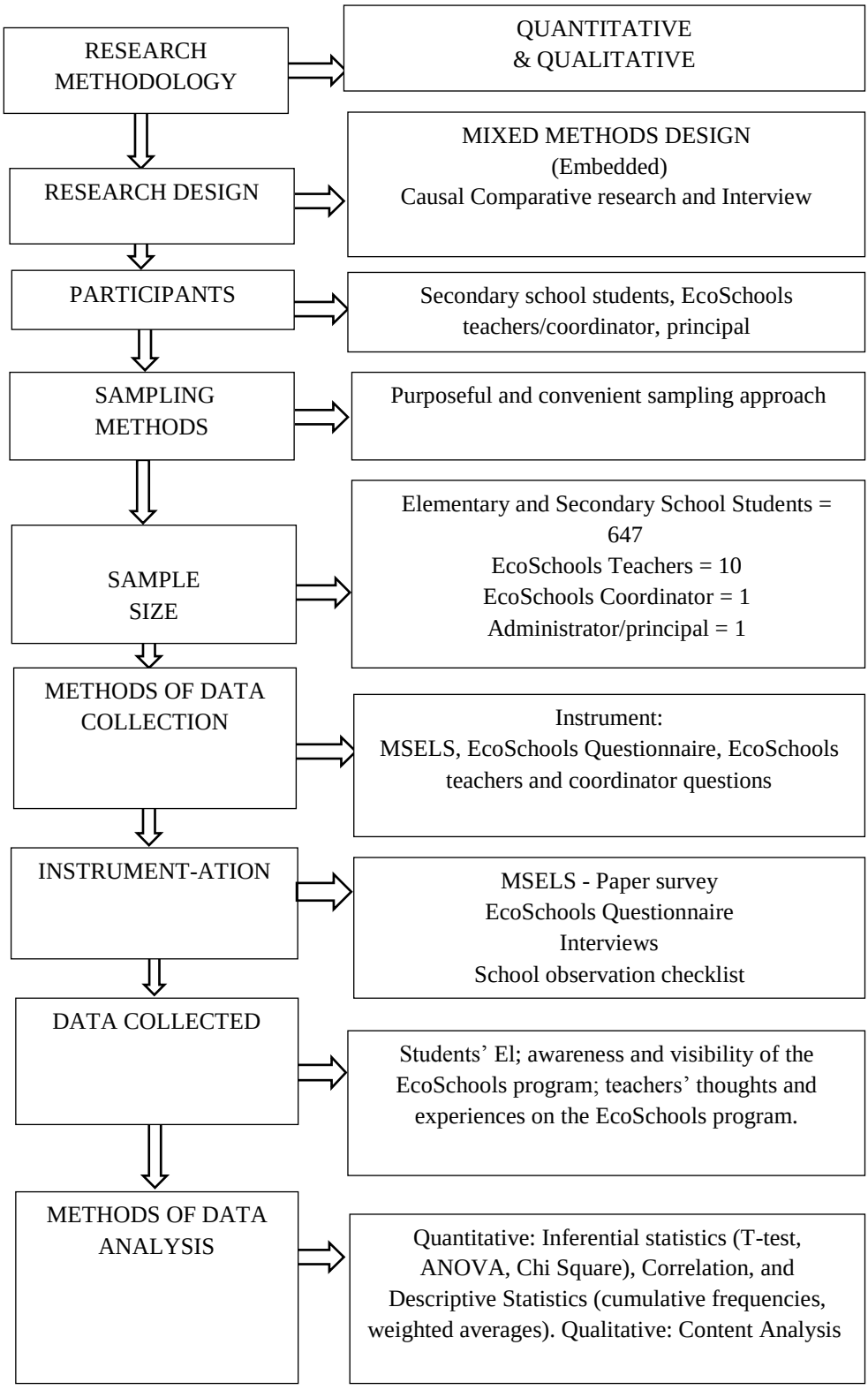

Figure 3.2. Schematic representation of the research methodology.

Quantitative design: Ex post factor or causal comparative research design. The quantitative design for this research was the Ex Post Factor or a causal comparative research method. The Ex post factor or a causal comparative research method is a non-experimental research method used to study and investigate causal relationships (McMillan & Schumacher, 1997). Ex Post Facto research looks at how an identified independent variable influences the dependent variable where the circumstances of conducting the research do not allow for an experimental design.

It also involves comparing groups to determine whether some independent variables have caused a change in a dependent variable (Lodico, Spaulding & Voegtle, 2006). This research design lends itself to use in studies involving variables that are often difficult or impossible to manipulate experimentally since the experience of interest had already occurred or influenced by other factors impossible for the researcher to control (in this instance, schools already involved with the EcoSchools environmental program).

Causal-comparative research entails identifying two or more groups that had different experiences and measuring how this had affected the variable of interest; in this case, the variable of interest in this study was EL and the groups of interest are schools with and without the EcoSchools programs and within the schools with EcoSchools' program, their various levels of certification (gold, silver, and bronze).

Limitations of causal comparative research design. Although the causal comparative research is great for researching variables that cannot be manipulated, has already occurred, or where experimental design is difficult, it has its' limitations. One major one is that the researcher cannot manipulate the variables.

The groups of interest are already formed prior to this research and subsequently, a seeming cause and effect relation may not be as is and may actually have some other

underlying factors contributing to the observed cause and effect relationship. Consequently, caution must be applied in interpreting the results from causal comparative research as such.

Survey. Survey research method has been described as "probably the most popular (quantitative) research design in the social sciences" and characterised by collection of data (Muijs, 2004, p. 34). Survey design is a procedure in quantitative research where an investigator administers a survey or questionnaire to a sample or the entire population of people in order to describe the attitudes, behaviour, opinion, or characteristics of the population of interest (Creswell, 2008).

Survey is characterised by the use of standard questionnaire for data collection. The researcher chooses a sample and administers the questionnaire or interviews them in order to collect data on variables of interest. In addition, survey can be used to describe incidence, frequency and patterns of variables in an identified population (McMillan & Schumacher, 1997, p. 36). Further, survey can be used to explore relationships between variables (p. 296). It could be administered by telephone, paper-and-pencil or web based (Muijs, 2004); meanings are interpreted by comparing results of statistical test to past studies (Creswell, 2008). Survey was used in this research as a means of data collection for the causal comparative research design. The MSELS was administered as a survey.

Interview. Interviews were used as one of the means of collecting qualitative data from the school board's EcoSchools Programs' Co-ordinator, EcoSchools teachers, and Principal. Interviews with the teachers were a written response. Although the nuances of body language were lost, the teachers had the opportunity to be as honest as they could without feeling inhibited while talking to the researcher.

The school principal and the EcoSchools Co-ordinator's interview were recorded.

Observation (schools). Finally, a Walk-Around observation sheet was used to collect additional qualitative data on the visibility of the EcoSchools program.

Research Participants

There were two groups of population for this research. The first group were students from grades 7-12 with a couple of students in grade thirteen. The second group of population were the EcoSchools teacher, the program Co-ordinator and principal. All the teacher participants except one were secondary school teachers, and all with various teachable subjects in science, computer science, environmental science and geography.

All research participants were from one single school board. This school board is a very diverse school board in southern Ontario with more than 35, 000 students in both its elementary and secondary school located in both the city and counties. The board is well diversified with students from various ethnic origins and socio-economic statuses. The EcoSchools Board Program Co-ordinator, the EcoSchools teachers, the school principal participants and the student participants were from 10 schools in the board

As a result of the confidentiality and ethical considerations of this research, other details and characteristics of the board may not be disclosed in order to protect their anonymity.

Sample Size

When it comes to sample size specification, there was no absolutes, but the larger the sample, the greater the chances of obtaining results similar to the population and the lower the sampling error (Creswell, 2008; Nardi, 2003). Creswell suggested sample size of 350 for a survey research.

For a population of about 14 000 students in the board's secondary school system, Creative Research Systems, (n.d.) online sample size calculator indicated that a sample

size of 576 student will be needed for a confidence interval of ±4 %, at 95% confidence level. To confirm the sampling size, Parizanganeh, Lakhan, Yazdani and Ahmad (2011) sample size formula below was used to compute the required number of samples, the sampling formula suggested that a total of 600 student participants would be required for the survey.

$$n = \frac{Z^2 pq}{e^2}$$

Where *n = sample size*

Z = desired confidence level (95%)

P = estimated proportion of the sample (50/50 or 0.5)

q = 1 – p

e = the desired level of precision (0.04)

With this formula, the sample size would be calculated as thus:

$$n = \frac{(1.96^2)(0.5)(0.5)}{(0.04)^2}$$

$$n = 600$$

A total of 648 students, participated in the survey. Ten teachers, a board co-ordinator, and one school principal participated in the interview.

Instrumentation

The data required for this study included: a) Students' EL, b) students awareness of the EcoSchools program, c) the visibility of the program, and finally, d) teachers and administrators thoughts and insights on the program. In Table 3.1, a summary of the instrument used for gathering the data and their purposes is presented.

Table 3.1.

Research Instruments and Variables Measured

DATA REQUIRED	INSTRUMENT
Students' EL	MSELS (Hungerford, Volk, McBeth, & Bluhm, 2009)[8] (see Appendix A).
Students awareness of the EcoSchools program	The EcoSchools Questionnaire (see Appendix B).
The visibility of the EcoSchools program	The EcoSchools Questionnaire and School Walk-Around Observation Sheet
EcoSchools teachers' perception of the EcoSchools program	EcoSchools Teacher Interview Questions (see Appendix C).
EcoSchools co-ordinator's perspective on the success of the program	Co-ordinator's interview questions (see Appendix F)
Administrator thoughts on the EcoSchools program	School principal discussion questions in Chapter 5.

MSELS. The MSELS 2009 version is a standardized EL survey instrument that assessed students EL using multiple choice and Likert scale type questions. It was developed and refined by Hungerford, Volk, Bluhm, McBeth, Meyers, and Marcinkowski (2008). It was developed in USA for use in assessing EL. It was developed to bridge the niche for an instrument that assessed all the components of EL (McBeth et al., 2008). In addition to the demographic components, it so includes the following:

> Environmental literacy components: (a) ecological knowledge; (b) verbal commitment; (c) actual commitment, or environmental behavior; (d) environmental sensitivity; (e) issue identification and issue analysis skills; and (f) action planning. As such, it includes measures in each of the four domains that are critical to environmental literacy: Knowledge, Affect, Cognitive Skills, and Behavior. The MSELS contains multiple choice and Likert-type items, and was designed to be administered within a traditional 50-minute class period. (McBeth, Hungerford, Marcinkowski, Volk, & Meyers, 2008, p. vii)

Table 3.2 summarises and provides a description of the EL components the MSELS measured, the questions structure and the raw scores for each EL scales.

[8] MSELS is a copyrighted EL assessment instrument. Copyright right permission to use instrument was obtained.

Table 3.2

EL Components, Questions Structures and Possible Scores of the MSELS

ENVIRONMENTAL LITERACY COMPONENT	MSELS CATEGORIES	QUESTIONS STRUCTURE	# OF ITEMS	MAX SCORE
Environmental Knowledge	Ecological Foundations	Multiple choice	17	17
Environmental affects	How You Think About the Environment	Likert scale	12	60
	You and Environmental sensitivity	Likert scale	11	55
	How You Feel About the Environment	Likert scale	2	10
Environmental responsible behaviour	What you do about the environmental	Likert scale	12	60
Environmental skills	Issue identification	Multiple choice	3	3
	Issue analysis	Multiple choice	6	6
	Action planning	Weighted items	8 (2 choices)	20
TOTAL				**231**

The MSELS was a combination of MSELI (Middle School Environmental Literacy Instrument) developed by Bluhm,, Hungerford and Volk in 1995 and CHEAKS (Children Environmental Attitude and Knowledge Scale) developed by Leeming, Dwyer and Bracken in 1995 (McBeth et al., 2008). After series of modification and testing of the instrument for a national environmental literacy assessment, the MSELIv9 was developed.

Validity of the MSELS. The validity of an instrument is the extent to which the inferences and uses made on the basis of the score from it are reasonable and appropriate (McMillan & Schumacher, 1997), or as Muijs (2011) defined it in terms of its function, validity asks the question, are we measuring what we want to measure? When an instrument measures what it's designed to measure, then it is considered to be valid. One way of establishing validity is through an in-depth review of the instrument which includes an examination of the instrument's items in order to ascertain that they are accurately measuring the content and objectives of interest.

In developing the MSELI, emphasis was placed on the validity of the variables that comprised EL (McBeth et al., 2008). The field testing scores in the 65 elementary school students—(grades 6-8) yielded an overall Cronbach's alpha coefficient of .817 for internal consistency. Ranges of subscales were from .701 and .869 with the exception of issue identification which had an alpha co-efficient of .389. (McBeth et al., 2008).

The MSELI was also tested for construct validity through a 16-member panel of six elementary and secondary school environmental science teachers, two districts EE co-ordinators, six university environmental educators and researchers and two officers from EE federal agencies. The key question the panel addressed while reviewing the instrument was "does this instrument reflect a reasonable definition of "Environmental Literacy?" (McBeth et al., 2008). The committee gave affirmative answers and the conclusion by 75% of the panel was that the instrument reflected no political, gender, or racial bias and the length was reasonable (McBeth et al., 2008).

Finally, after a series of psychometric testing and analysis, the MSELIv9 was further modified to eventually evolve into the MSELS with an affect component— love for the environment (see McBeth et al., 2008, for a full historical chronicle on the development, statistical and psychometric testing of the MSELS instrument).

Reliability of the MSELS. Reliability is a measure of consistency. It "means that the score from an instrument are stable and consistent" (Creswell, 2008, p. 169). It is also the extent to which the test score is free of errors (Muijs, 2011). A re-test of reliability indicated a similar (to the MSELIv9) Cronbach Alpha co-efficient of .717-.847. The reliability of the MSELS scales was conducted using data from the national baseline survey from grades 6 and 8 students. Overall, almost 5000 students contributed to the data used for determining the reliability of the MSELS instrument.

The Flesch Reading Ease and Grade Level Indexes for readability of the MSELS was 66.4; which indicates a standard reading ease and deemed acceptable for the instrument. The index was "based on the average number of syllables per100 words and the average number of words per sentence" (McBeth et al., 2008, p. 18). The current MSELS instrument contains demographic items, and all answers can be recorded on Scantron.

Components of EL measured by MSELS. As indicated in Table 3.2, the MSELS measures the following component: environmental knowledge, environmental skills, environmental affects and finally environmental responsible behaviour. The components are summarised briefly in the following sections.

Environmental knowledge. The Ecological Foundation section of the MSELS falls under this category of EL component; this part of the test was used to gather data on students' foundational knowledge of the environment and the ecosystem. The knowledge components of the EL assessment comprised of items that shed light on students' knowledge of physical and ecological systems – like relations in ecosystems; energy transfer and cycles of matter in ecosystems; interactions and interrelationships among major systems; Earth's surface processes; the effects of human activities on the environment; environmental problems and issues associated with them (biophysical impacts of threats). The ecological foundation covered the basics of environmental knowledge. Questions were multiple choice (as indicated in Table 3.2), descriptive and of a general knowledge/common sense nature and were designed for middle school students.

Environmental competencies—skill. The environmental competencies section assessed students' proficiencies in identifying, analysing, evaluating potential solutions, proposing and justifying actions that address environmental issues (Hollweg et al., 2011;

Marcinkowski, 1997). Under environmental competencies, the MSELS utilised the following sections "Issue Identification", "Issue Analysis" and "Action Planning".

Environmental dispositions—affect. For environmental dispositions, the MSELS assessed students thoughts, actions toward/for, sensitivity, and finally their environmental feeling using the following categories: "How You Think About the Environment", "You and Your Environmental Sensitivity", and "How you Feel About the Environment".

Environmentally responsible behavior. Students reported pro-environmental behavior intended to have a positive impact on the ecosystem by targeting problems and issues, as well as those that actually have a positive environmental consequence" (Hollweg et al., 2011, p. 3-12) were assessed in this category. The MSELS section titled "What you Do About the Environment" covered it.

Justifying the Use of MSELS for the Research

The MSELS as previously mentioned was designed for middle school students in America. There was no evidence that the instrument, or any of its older versions, has been used in study in Canada for EL assessment. There were initial concerns that an instrument designed for middle school students may be skewed in favor of high school students since EL is a continuum and the participants were deemed to have acquired more knowledge as a result of their longer stay in school.

Eventually, the MSELS was chosen for the following reasons: first, the original designers deemed it fit for high school, second, professionals in the field did not see any major issue in using it to assess EL and finally, other studies that focused on designing EL instruments for even older students have also used questions from MSELS (e.g., Kyriazi & Mavrikaki (n.d.).

In my personal communication with one of the MSELS designers, he stated that while they believed that seven of the eight scales would be appropriate for assessing EL among secondary school students, one scale, ecological knowledge, was probably too simple and may not provide enough variability in content (personal communication with B. McBeth, November 12, 2013). After further consultation with his colleague and instrument co-designer, Trudi Volk, they agreed that the MSELS, which was a revised version of the MSELI, would be appropriate for EL assessment for high school students.

Also, professionals in environment and science field (e.g., dissertation supervisor, EcoSchools' teachers/co-ordinators, and the school board's EcoSchools co-ordinator), all agreed that the instrument was relevant and that the said easier ecological knowledge scale could only boost students' scores rather than negatively affect their overall performance. Overall, they decided that the tangential discussion that would result from the outcomes of the assessment would provide a great platform for analyzing high school students EL and the ensuing comparison with middle school students.

When the issue of Canadian students' homogeneity to that of U.S.A. was raised, they also agreed that the K-12 student population in US may be considered similar to Canadian students in this research. This is further substantiated by Lin, & Qingmin (2014) in their claim that "Canada and U.S. share similarities in education including universal and decentralized public systems, diversity in student population, and historical roots in formalizing (EE)" (p. 74).

In order to rectify any bias in language, the term Sierra Club on page 11 of the MSELS was explained to the students (since it was not a common term in their vocabulary) and the word *Canada* (or *Canadian*) was used to replace "U.S.A" in the

survey. In addition, the ages and grades of students in the demographic section were changed to reflect the participation of high school students. These were part of the additional instruction written out for students on the chalk board.

The EcoSchools Questionnaire. The EcoSchools questionnaire was developed by the researcher and was used for gathering data on participating schools, students' environmental background, level of participation in EE programs, source of environmental knowledge, and finally their level of awareness of the program. For the section on students' awareness and the visibility of the EcoSchools program, questions were designed using the contents of EcoSchools certification criteria (see literature review) and common environmental practices and tips for success prescribed by the program in the following six areas: team work and leadership; energy conservation; waste minimisation; school ground greening; curriculum; and environmental stewardship.

I summarised the component of the EcoSchools Questionnaire and information gathered in Table 3.3. See Appendix B for the EcoSchools Questionnaire.

Table 3.3

Description of the EcoSchools Questions

VARIABLE MEASURED	QUESTION STRUCTURE	POSSIBLE MAX SCORE
Students' and Schools Demographics and Background Information	Yes or no and fill in the blanks questions.	NA
Environmental Background Level of Participation in an EE Program	Fill in the blanks Yes or no, fill in the blanks and multiple choice questions.	NA
Source of Environmental Knowledge	Likert scale type questions	NA
EcoSchools Awareness (A) and Noticeability Questions (N)	Yes or no and fill in the blanks questions.	N = 13 A = 13
Total		26

Establishing content validity of the EcoSchools' Questionnaire. It is important that the Questionnaire contained the depth and breadth of the content it was set to

measure without ambiguity. As previously stated in Table 3.1, the purpose of the instrument was to gather data on participating students' demographics, students' awareness and the noticeability of the EcoSchools program.

To establish the content validity, an expert panel was utilised as suggested by Lodico, Spaulding and Voegtle, (2006). A panel of five (a school board EcoSchools co-ordinator, two secondary school teachers – geography and science (also EcoSchools co-ordinators), and two PhD candidates (Cognition/Learning and Educational Leadership) were enlisted to check for content validity of the instrument.

The panel was asked whether the content of the questionnaire had the capacity to assess the visibility and noticeability of the EcoSchool program, determine students' main source of environmental knowledge and their level of participation in an environmental education program. The panel was also given the purpose of study and the research questions concurrently as they examined the instrument.

The panel offered advice on various aspects of the instrument, for example, the content and grammar. Redundant questions were dropped, grammatical errors were corrected and a couple of questions were added. There was a consensus among the panel that the questionnaire was reasonable (once the modifications were made) and in terms of its' content, was capable of meeting the purpose for which it was designed.

EcoSchools' Questionnaire reliability. The EcoSchools' Questionnaire was self-designed using contents that reflected the EcoSchools program core practices (see Appendix B). The instrument was pilot tested for reliability and time required for completion. A test-retest method was used to assess the reliability of the Questionnaire for the awareness and noticeability sections.

A total of 27 grade 10 students completed the questionnaire. The instrument was re-administered four weeks later. The average completion time was seven minutes. SPSS was used to compute the Cronbach alpha. The Cronbach alpha for the awareness and noticeability sections combined was .84. They each had Cronbach alpha scores of .81 and .87 respectively. Thus, the Questionnaire was deemed reliable for use in terms of its reliability for the awareness and visibility questions.

Teachers' Interview Questions. A set of interview was designed and administered to the EcoSchools teachers and the co-ordinator. The questions were also guided by the content of the EcoSchools' certification requirement guide (Ontario EcoSchools, 2010).

The content of the teachers' interview questions was review for structure with a panel of six which comprised of three PhD candidates in Educational Studies, two high school teachers (English and geography) and a school board's Program Co-ordinator.

The panel was presented with the purpose of the interview (which was to gain more insight into teachers' perspective on the program, what worked and what needed to be done to make it better) and asked if the questions were broad enough to cover the purpose of the interview. All panel members returned their copy with suggested amendments and additional questions. The teachers recommended that two of the questions be deleted due to ethical consideration and loyalty to employer (see Appendix D).

The interview had both open ended and close ended questions to capture teachers' demographics and their thoughts on the program. For the complete interview questions, see Appendix D and E for the original and panel corrected questions.

School board EcoSchools' Co-ordinator and principal's interview questions. The school board's EcoSchools' Co-ordinator interview questions were designed by the researcher and were only checked for grammatical errors by a high school English teacher and two university professors (science education). The school principal interview was an informal interview/conversation and the questions emerged as the conversation proceeded. See Appendix F for Co-ordinator's interview

School Walk-Around Checklist. The school Walk-Around Checklist was designed by the researcher to capture the visibility of the EcoSchools paraphernalia (flag, display board, stickers promoting responsible environmental behaviour, EcoSchools' recycling bins, school yard greening, outdoor environmental activity and space). These parameters were also within the contents of the EcoSchools certification requirement guide (see EcoSchools, 2010—*2015-2016 Certification Guide*) and tips for success

The content of the checklist was also checked for grammar and relevance by two PhD students in Educational Studies and a secondary school English language teacher. See Appendix G for checklist.

Data Collection and Sampling Procedure

As a result of the restriction (emphasis on keeping external interruptions to a minimum) inherent with working with schools, the school community and the nature of the data collected, a non-probabilistic sampling approach was used for two different sets of data collected for the research. Three data sets were needed for this research, they were data from: Students' EL; teachers' interview and school observation.

Sampling of student participant. Convenient and purposive sampling approaches were utilised. Participants were selected based on their teachers' willingness and availability to participate in the research and the student's consent. Also, in some

instances, the school administrator assigned the class they felt was the best option. Data collection continued until the desired number of participants was reached.

For the first group of participants (students), the data collection process was as follows:

1. Ethical approval was sort for research from the University of Windsor as a result of human participants.
2. Ethical approval was also sought and received from the participating school board and one after school teen organisation. As a result of the board's restrictions, the name of the board, the schools and all the participants are not included in this research.
3. A total of 13 school principals were approached for permission to conduct a survey. Twelve school principals gave their permission, one principal did not respond. Since enough schools were recruited, there was no follow-up on the non-responding principal.
4. The EcoSchools teachers from each of the participating schools were then identified approached and invited to participate in the research. Eleven teachers were invited, 10 of the teachers accepted the invitation to participate in the teacher survey, and one of the teachers did not respond (she retired within the same period). Six more teachers that were not EcoSchools teachers were also invited to participate; five accepted the invitation for a total number of fifteen participating teachers.
5. Ten schools and a teen organisation were selected to participate in the survey. Selection of the schools was based on the willingness of the teacher to participate in the research.

6. Within a period of two months (October through December), permission forms were given to students in thirteen of the participating fifteen teachers' classes to obtain parental consent before the survey was conducted.
7. Ninety five percent of all the permission forms sent home for parental consent were returned indicating students and parental consents to participate in the research.
8. Surveys were administered to students that retuned their forms. The teacher provided an alternative class work for students who did not have signed parental consent to participate in the survey.
9. On the day of the survey, EL survey booklets were given to students, they were told they could withdraw from participating at any time, the surveys were confidential and students were told not to write their names in the booklet.
10. A total of 648 surveys were given out. One student withdrew from the survey. Students returned survey once they were done.
11. At the end of the survey, students entered their names on a piece of paper for a chance to win a $25 gift certificate assigned to each participating teachers' class.

Sampling of teacher, board EcoSchools co-ordinator and principal. All EcoSchools teacher co-ordinators were identified in the participating schools and invited to take part in the research. All 10 teacher co-ordinators responded and completed an interview questionnaire.

The board's EcoSchools co-ordinator and the school principal both volunteered to participate in the research in order to provide further insights into the organisation of the programs and some inherent problems. For the EcoSchools teacher co-ordinators, the following were the sampling procedure:

1. A total of 13 school principals were approached and asked for permission to conduct a survey. Twelve school principals gave their permission, one principal did not respond. Since enough participants were recruited, there was no follow-up with the non-responding principal.
2. The EcoSchools teacher co-ordinators from each of the participating schools were identified, approached and invited to participate in the research. Eleven EcoSchools teachers were invited, ten of the teachers accepted the invitation to participate in the teacher survey, and one of the teachers did not respond (she retired within the same period). The EcoSchools Program Board Co-ordinator graciously volunteered for an oral interview when he heard about the research.
3. An oral interview was conducted with the EcoSchools Program Board Co-ordinator and the school principals.
4. Teacher interview questionnaires were given to 10 teachers to be filled out and returned promptly. Six of the surveys were mailed out electronically and four paper copies were given to the participating teachers.
5. All 10 teachers completed their interview questionnaire. Four of the teachers returned their completed interview electronically while six of them returned paper copies.

6. All participating teachers were given a $10 Tim Hortons'gift certificate once they returned their interview/survey.

Procedure for school Walk-Around . Once the students' EL surveys were done, the school walk around checklist was used to make observations and commentaries on the visibility of the EcoSchools program in each of the participating schools. Various visibility components that characterises EcoSchools, for example; school ground greening, presence of an eco-board, eco flag, aesthetic and general conditions of the eco board, availability of EcoSchools special recycle bins, and other visible cues encouraging good environmental practice were recorded. See Appendix G for the school Walk-Around observation sheet and checklist.

Assumption

EL is complex and can be influenced by several elements (including but not limited to programs not identified by the researcher, parental influence, teachers' influence as role models, books, individual interest among others (see Bogner, 1999; Culen & Mony, 2003; Dimopoulos, et al., 2008; Ruiz-Mallen et al., 2009). Other factors that may account for a higher EL are parental influence, general school environmental awareness, and membership in an environmental club, boys and girls scout, or having taken extra courses in geography or environmental sciences.

However, the general consensus among these studies is that in schools where any forms of EE programs and initiatives are routinely used to teach EE (separate from the usual school subjects), students' overall EL might be generally higher than other schools where similar programs are not utilised.

Hence, it is assumed in this research that the MSELS is capable of assessing students EL and in instances where the program is in place, be able to show a level of difference (higher EL) from students in schools where the EcoSchools was not in place.

Variables

A variable "is a characteristics of an individual or organization that (a) researchers can measure or observe and (b) varies among individuals or organizations….They are key ideas that researchers see to collect information on to address the purpose of study" (Creswell, 2008, p. 123).

Independent variable. In this study, the independent variables are:

- Eco and non EcoSchools ― Schools participating or not participating in the program (among the ten schools used, nine were EcoSchools and one was not among the EcoSchools).
- Level of certification ―Schools' level of certification could be gold, silver or bronze.
- School location―schools could either be located in the city or in the county.
- Grade―the grade of participants which ranged from grade 7-13.
- Source of environmental knowledge―Students' main source of environmental knowledge from a selection of the following; television, school subjects, eco-clubs, books, web and internet, friends and others.

Dependent variable. The main dependent variables of study are: Students' score in the EL survey and students' level of awareness of the EcoSchools program.

Data Analysis Procedure

Data collected were both quantitative and qualitative in nature; hence, data analysis was in two parts. Students EL literacy survey was analysed quantitatively using SPSS 22, while the interviews and school observation sheets were analysed qualitatively using content analysis procedure.

Quantitative data analysis procedure. The procedure for analysing the quantitative data (students' EL survey) is summarised in *Figure* 3.3. Subsequent sections depict the various analysis used for answering the specific research questions and testing the hypotheses.

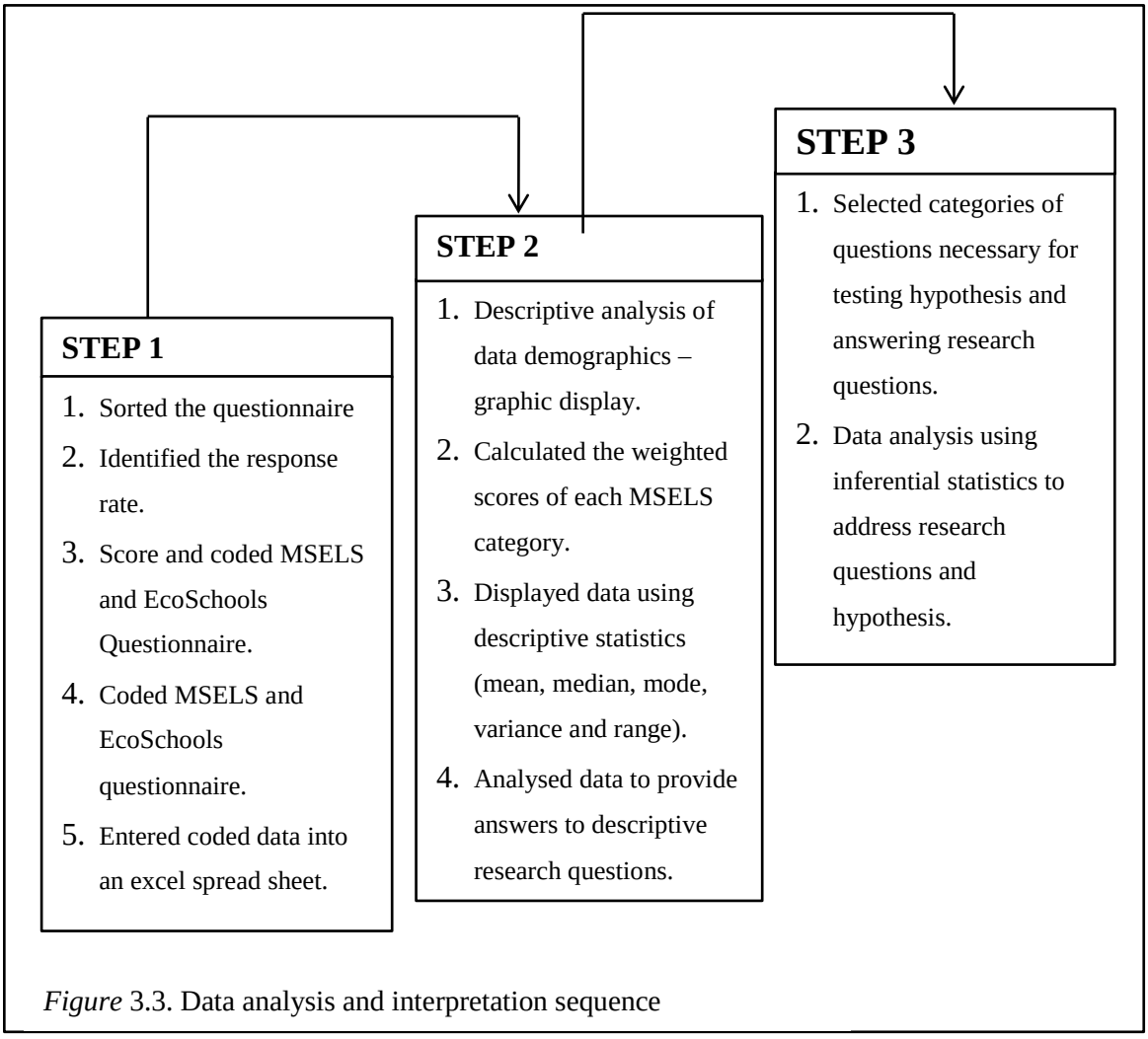

Figure 3.3. Data analysis and interpretation sequence

Determining students' EL level. The MSELS measured eight aspects of EL; the total mark from the MSELS was 231; this score was the sum of all the components of the EL measured by the MSELS instrument. Before the hypotheses were tested, students' EL levels were determined as follows:

1. The eight aspects assessed by the MSELS were grouped into four main components of EL: Environmental knowledge; environmental affects—environmental dispositions; environmental responsible behaviour; and environmental skills—competencies.
2. As a result of the varying number of questions in each category of the MSELS, a multiplier was calculated and used to find the weighted average of each of the MSEL components. This helped to account for the sections that have fewer questions and ensure that no category casted an undue influence over the overall students' EL scores (see Table 3.4 for the multiplier factor used in each category).
3. The MSELS was then scored and students' performance categorised using the Ontario Ministry of Education's achievement categories as shown in Table 3.5.

Table 3.4

EL Components and Multiplier Factors

ENVIRONMENTAL LITERACY COMPONENT	MSELS CATEGORIES	# OF ITEMS	MAX TOTAL SCORES	WEIGHT	FACTOR*
1. Environmental Knowledge	Ecological Foundations	17	17	25%	1.47
2. Environmental affects	How You Think About the Environment	12	60	12%	0.2
	You and Environmental sensitivity	11	55	11%	0.2
	How You Feel About the Environment	2	10	2%	0.2
3. Environmental responsible behaviour	What you do about the environmental	12	60	25%	0.416
4. Environmental skills	Issue identification	3	3	2.6%	0.862
	Issue analysis	6	6	5.2%	0.862
	Action planning	8 (2 choices)	20	17.2%	0.862
TOTAL			**231**	**100%**	

**A weight of 25% was assigned to each component. A multiplier factor was calculated using the 25% assigned weight.*

The category in Table 3.5 was used to summarise and determine the performance of the students on their EL test. Students' EL level was determined based on the Ontario Ministry of Education (2010) grade structure. The results were displayed using descriptive statistics and graphs.

Table 3.5

Ontario Ministry of Education Achievement Categories

Levels	Score Category and Descriptions
Level 1	50 – 59% below provincial standard
Level 2	60 – 69% approaching provincial standard
Level 3	70 – 79% provincial standard
Level 4	> 80% above provincial standard, Ontario Ministry of Education, 2010

Categorising scores into Roth's EL continuum. Also, students' scores on the EL test was categorised using Roth's continuum. The classifications were done using the criteria outlined in Table 3.6. All scores falling within the functionally and operationally

literate group were classified as environmentally literate while other scores were categorised as falling within the environmentally illiterate category. This is justifiable since the Ontario Ministry of Education (2010) recognises scores within the level 3 range as meeting the provincial standard while score within the level 4 range exceeds the provincial standard (Ontario Ministry of Education, 2010).

Table 3.6

EL Categories Using Roth's EL Continuum and Ontario School Assessment Levels

Criteria	**Continuum of Literacy**
Scores below level 1 range (<50%)	Approaching nominal literacy (1)
Scores within the level 1 range (50 -59%)	Nominally literate (2)
Scores within the level 2 range (60 – 69%)	Approaching functional literacy (3)
Scores within the level 3 range (70 – 74%)	Functionally literate (4)
Scores within the level 3 range (75 – 79%)	Approaching operational literacy (5)
Scores within the level 4 range (80% and above)	Operationally literate (6)

Test of Hypotheses. The hypotheses formulated from the research questions are recapped in the following section, the decisions rules are also stated. *P*-values represent results of statistics that is used to test the statistical hypothesis.

Hypothesis 1— Majority of the students' surveyed (51%) will not score a level 3 or higher in the EL assessment. Descriptive statistics using a cumulative frequency distribution table was used to test this hypothesis since the hypothesis is descriptive in nature and required only a frequency table in order to calculate the percentage of students falling under the desired categories. To test this hypothesis, EL raw scores were converted into levels (see Table 3.2) and a cumulative frequency table was created using SPSS 22. The cumulative percentage under each level was determined in order to reject or accept this hypothesis.

Decision rule. If the % of students scoring < level 3 in EL assessment ≥ 51%, then accept the H_0.

Hypothesis 2 — there is no significant difference in EL scores of students in EcoSchools and non-EcoSchools. In order to test for a significant difference in the EL scores of students in EcoSchools and non-EcoSchools, the independent-samples t-test statistic was used. Comparison of the means of the two different samples was made. The two-tailed t-test test of significance examined whether the mean of one distribution differed significantly from the mean of the other distribution, irrespective of direction ―positive or negative (George & Mallery, 2010).

Decision rule. If $p > 0.05$, accept H_0.

Hypothesis 3— there is no significant difference in EL scores of students in gold certified schools, silver certified schools and non-EcoSchools (schools with no EcoSchools' certification). To test for a significant difference in the EL scores of students in gold, silver and non-EcoSchools, a one-way ANOVA was used. ANOVA is used for comparing the sample means of corresponding population distribution to see if there is sufficient evidence to infer if the means of the corresponding populations differ (George & Mallery, 2010, p. 144). Further test to determine specifically which groups were different from the other was conducted using Tukey HSD statistics.

Decision rule. If the significance value $p > 0.05$ (α), accept H_0.

Hypothesis 4— there is no significant difference in EL scores of students in county schools and those in city schools. To test the hypothesis, the participants were put in two separate groups, county and city schools. The independent sample t-test was performed in order to enable the comparison of the means of the two different samples. The two-tailed t-test was used.

Decision rule. If the significance value – p (2-tailed value) > 0.05 (α), accept H_0.

Hypothesis 5— there is no significant difference in EL scores of students in different grade levels. In order to test for a significant difference in the EL scores of students various grade levels, students were grouped under six different grade levels (grade 7-13), and an ANOVA test statistics was used to test for significant. ANOVA was chosen to test whether there was sufficient evidence to infer if the means of the various grades differed (George & Mallery, 2010, p. 144). Further test to determine specifically which groups were different from the other was conducted using Tukey HSD statistics.

Decision rule. If the significance value - $p > 0.05$ (α), accept H_0.

Hypothesis 6— Majority of students in EcoSchools (51% or higher) are not significantly aware (level 3 or higher) of their schools as part of the EcoSchools program. This hypothesis was formulated to determine the students' level of awareness of the EcoSchools program in their schools. The hypothesis was tested using a cumulative frequency distribution table since only the percentages of the distribution were required to determine or make the decision about the hypothesis.

Decision rule. If the % of students scoring < level 3 in EcoSchools awareness is ≥ 51%, then accept the H_0.

Hypothesis 7— there is no significant difference in students' level of awareness of the EcoSchools program in schools with different level of certification. The Chi-Square (χ^2) test was used to test this hypothesis. The purpose of the χ^2 "statistics test of independence was to determine whether the observed values for the cells deviate significantly from the corresponding expected values for those cells" (George & Mallery, 2010, p. 107).

Decision rule. If p value < 0.05, then reject the H_0.

Hypothesis 8— Students' main source of environmental knowledge is not the EcoSchools program. An objective weighted ranking was used to test this hypothesis. The source of environmental knowledge with the highest weight was ranked first and the source with the lowest weight was ranked last.

Students were asked the extent (on a Likert scale 0 – 4; with 0 representing no extent and 4 representing to a great extent) to which the following (television, school subjects, EcoSchools club, books, web/internet, friends and others) factored as a source of their environmental knowledge. Students provided a rank of 0-4 for each factor. Their responses were tallied to create a cross-tabulation frequency table (see Table 3.7). Frequencies were then multiplied with the weight of the Likert category. Rows were added to make up the total. The highest ranked factor was the factor with the highest total and so on.

Table 3.7

Source of Environmental Knowledge

FACTORS		No Extent (0)	Some Extent (1)	Moderate Extent (2)	Large Extent (3)	Great Extent (4)	TOTAL
1	Television	# x 0	# x 1	# x 2	# x 3	# x 4	
2	School Subjects						
3	EcoSchools' Club						
4	Books						
5	Web/Internet						
6	Friends						
7	Others						

Note. # represents the observed frequency.

Decision rule. From the weighted ranking, the factors are ranked from the highest to the lowest weight. The factor ranked first is the main source of environmental knowledge for students. Therefore, if the factor ranked first is not the EcoSchools program, then accept null hypothesis.

The summary of the hypotheses test are presented in Table 3.8.

Table 3.8

Test of Hypotheses Summary Table

S/N	Hypothesis	Statistical Test Performed	Decision Rules
1	Majority of the students' surveyed (≥51%) will not score at a level 3 or higher in the EL assessment	Cumulative frequency distribution table	If the % of students scoring < level 3 in EL assessment ≥ 51%, then accept the H_0.
2	There is no significant difference in the EL scores of students in EcoSchools and non- EcoSchools.	Independent sample t-test	If p (2-tailed value) > 0.05, accept H_0
3	There is no significant difference in the EL scores of students in gold certified schools, silver certified schools and non-EcoSchools (schools with no EcoSchools' certification).	One way ANOVA	If the significance value – p > 0.05 (α), accept H_0.
4	There is no significant difference in the EL scores of students in county schools and those in city schools.	Independent sample t-test	If the significance value – p (2-tailed value) > 0.05 (α), accept H_0.
5	There is no significant difference in the EL scores of students in different grade levels.	One way ANOVA	If the significance value - p > 0.05 (α), accept H_0.
6	Majority of students in EcoSchools (51% or higher) are not significantly aware (level 3 or higher) of their schools as part of the EcoSchools program.	Cumulative frequency distribution table	If the % of students scoring < level 3 in EcoSchools awareness is ≥ 51%, then accept the H_0.
7	There is no significant difference in students' level of awareness of the EcoSchools program for schools with different levels of certification (in other words, students level of awareness is not related to schools certification level).	χ^2	If p value < 0.05, then reject the H_0.
8	Students' main source of environmental knowledge is not the EcoSchools program.	Objective weighted ranking	If the factor ranking #1 ≠ EcoSchools program, then accept null hypothesis.

Qualitative data analysis. Content analysis technique was used to analyse the qualitative data.

Rationale. The content analysis technique was chosen because it is an interpretive approach. According to Berg (2001), the interpretive analysis procedure "allows researchers to treat social action and human activity as text. In other words, human action can be seen as a collection of symbols expressing layers of meaning. Interviews and observational data, then, can be transcribed into written text for analysis" (p. 239). Content analysis involves data coding, categorizing and classification with the sole

purpose of making sense of the information collected and highlighting the main themes and/or findings of the collected documents.

Content analysis. Content analysis is "a research technique for the objective, systematic and quantitative description of the manifest content of communication" (Berelson, 1952, p. 19). A more recent definition of content analysis by Krisppendorff (2013) removes the term quantitative and defined it as "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the context of their use" (p. 24).

Krisppendorff (2013) advised that analysis should start with research question by offering two reasons. First was centered on efficiency and empirical grounding. Krisppendorff posited that when content analysis was guided by specific questions, it becomes much easier for the data analyst to advance much faster by sampling relevant texts to answer research questions.

Second, Krisppendorff suggested that when content analysis is guided by proffering answers to the research questions, or in the case of this research, supporting findings and answers it, it grounds the technique empirically; providing support to truth claims (from plausible argument or related observation) made by research questions. Hence, "formulating research questions so that the answers could be validated in principles protects content analyst from getting lost in the mere abstractions of self—serving categorizations" (p. 38).

Limitations of Content Analysis Technique. Content analysis has a number of limitations. Berg (2001) considered the most serious limitation of content analysis to be issues in "locating unobtrusive messages relevant to the particular research questions. In other words, content analysis is limited to examining already recorded messages. These

messages may be oral, written, graphic or videotaped; they must be recorded in some manner in order to be analyzed" (p. 259).

Nevertheless, Berg went on to state that the weakness is greatly reduced when content analysis is used as an analysis tool rather than as a complete research strategy. Specifically for this research, content analysis served as a technique for analyzing the interview data, teacher responses to open ended questions and the Walk-Around observation sheet, the above weakness that Berg stated, is minimized, since the qualitative aspect of this research was not designed to stand alone; rather, the qualitative aspect was designed to offer additional explanation, insights and meaning into majority of the research questions answered by the quantitative aspect of the data analysis.

Another limitation of the content analysis technique highlighted by Berg is the ineffectiveness of the technique for testing causal relationships between variables. Content analysis is a descriptive method. However, this limitation is immaterial in this research since the main purpose of the qualitative data was not to provide basis for testing causal relationship between variables but to: enhance the study with a second research method, understand the research and its findings through other participants of the EcoSchools program point of view and experiences, and finally, to help in further explaining and providing insights into results obtained from the quantitative methods.

Suggested steps for content analysis of qualitative data. Step 1 — Data collection and transcription. Step 2 — Analytical development of codes or inductively identified in the data. Step 3 — Transformation of codes into categorical labels or themes. Step 4 — Categorization - Sorting of materials into categories, identifying similar phrases, patterns, relationships, and commonalities or disparities. Step 5 — Making meanings – sorted materials are examined in order to isolated meaningful patterns and

processes. Step 6 — Generalization – identified patterns are considered in the light of previous research and the theories, and a small set of generalisations are established. (Berg 2001, p. 240).

Interview data analysis sequence using content analysis technique. The above general sequential steps for content analysis described by Berg (2001) formed the basic sequence for the qualitative data collection and analysis in this research. The sequence of the interview data analysis employed in this research are as follows:

A. Data collection process
    - Interviews – Recording (board EcoSchools Co-ordinator and school principal), completion of questionnaires by teachers;
    - Observation using School Walk-Around sheet (see Appendix G).

B. Interview transcriptions and data entry into word document.

C. Reading through the transcript and taking brief notes of interesting and emerging themes.

D. Grouping the themes into main and minor themes and removing redundant themes.

E. Categorizing relevant information into emerged themes.

F. Comparing and contrasting the various main and minor themes.

G. Repeating sequence C to F again to ensure that nothing was left out.

H. Checking through the emerged themes for relevance to research and cleaning out irrelevant information.

I. Checking to see if further categories or themes can be merged without losing meaning.

J. Checking the original transcript and ensuring that all the necessary information were included.

Interviews were analyzed separately in three parts: teacher's interview, board Co-ordinator interview and the principal's interview. Also, the schools' observation Walk-Around sheets were also analyzed separately from the interviews.

Schools Walk-Around data analysis sequence using content analysis technique.

a. Data were collected using the schools' Walk-Around observation sheet.
b. Data were inputted into word document.
c. Codes were developed/inductively identified in the data.
d. Codes were transformation into categorical labels/themes.
e. Materials were sorted into categories, identifying similar commonalities or disparities.
f. Sorted materials were examined in order to isolated meaningful patterns and processes.

Ethical Considerations for Research Participants

Student participants in this study were considered minors so ethical approval was sought and received from the University of Windsor, the school board and the teen organisation that participated in this research. Letters seeking parental permission (see Appendix K) was also sent home and parental signatures were obtained.

Only students with returned copies of parental permission forms participated in the research. The students, teachers and school board were assured of the confidentially of their answers and right to withdraw as a participant at any time.

CHAPTER 4

PRESENTATION AND ANALYSIS OF DESCRIPTIVE QUANTITATIVE DATA

Data from the students' EL survey is presented in this chapter. Frequency tables are arranged and delineated according to the following: by demographics; demographics of the participating schools (schools location—city and county schools and number of total number of participants); and other EcoSchools independent factors and variables from the EcoSchools' questionnaire—schools' EcoSchools' status, EcoSchools awareness and visibility, source of environmental knowledge, and spatial technique inclusion).

EL scores were summarized using the following independent variables: participating schools, students' grade levels, schools location (city and county), EcoSchools' status, and finally, EcoSchools' levels of certification. In addition, EL scores were also converted to two grading schemes: the Ontario assessment chart and Roth's EL continuum.

Students Demographics

Demographics included students' gender, ethnicity, grades, favorite subjects, members of an eco-club, and their frequency of participation in an eco-club. A total of 641 students took the EL survey. Twenty incomplete and unusable surveys were discarded.

Among those surveyed, 47.2% were males and 52.8% were females. Majority of the students were Caucasian (57.6%). Native Canadians accounted for 9.9% of the participants, Asians—18.4%, Hispanic- 3.7%,, Black—8.2%, and mixed—0.3% respectively.

Grade. Participants who took the EL survey ranged from grade 7-13. The majority of the participants were either in grades 10, 11 or 12 accounting for 37.4, 27.6

and 30.2 % respectively. Other grades were 7 and 8, grade 9 and grade 13 accounting for 0.6, 3.9 and 0.3% respectively. See Table 4.1 for the distribution of students' grades.

Table 4.1

Grade Level Distribution of Survey Participants

		Frequency	*Percent*	*Valid Percent*
Valid	Grade 7 & 8	4	0.6	0.6
	Grade 9	24	3.8	3.9
	Grade 10	232	37.1	37.4
	Grade 11	171	27.4	27.6
	Grade 12	187	29.9	30.2
	Grade 13	2	0.3	0.3
	Total	620	99.2	100.0
Missing		5	0.8	
Total		625	100.0	

Member of an eco-club/environmental group (past or present). Students were asked to indicate if they had ever been a member of an eco-club or environmental group of any kind including the Boys and Girls Scout. Among the 610 usable responses, 136 (22.3%) indicated that they are or have been a member of an environmental club, while 473 (77.5%) indicated that they have never been in an eco or environmental club. Table 4.2 shows the frequency distribution of students' responses to the question.

Table 4.2

Students Membership in an Environmental Club

		Frequency	*Percent*	*Valid Percent*
Valid	No Answer	1	0.2	0.2
	Member	136	21.8	22.3
	Non-Member	473	75.7	77.5
	Total	610	97.6	100.0
Missing		15	2.4	
Total		625	100.0	

Currently participates in an environmental club. Students were asked if there were currently participating in any environmental club. Out of the 609 students that provided an answer (see Table. 4.3), 87.8% said they were not currently participating in

any environmental club. Only 12.2% said they were currently participating in some form of environmental club.

Table 4.3

Participation and Non-Participation in an Environmental Club

		Frequency	*Percent*	*Valid Percent*
	No	535	85.6	87.8
	Yes	74	11.8	12.2
	Total	609	97.4	100.0
Missing		16	2.6	
Total		625	100.0	

Frequency of participation in an eco-club. Among the students that were currently participating (74 students) in an environmental club, 69 of them stated their level of participation. Among these students 43% of them participated weekly, 27.5% participated less than twice a semester, while 30.4% participated at least twice a semester. The breakdown of students' level of participation is given Table 4.4 .

Table 4.4

Level (Frequency) of Participation (0-4)

		Frequency	*Percent*
LEVEL OF PARTICIPATION	Rarely	19	27.5
	Twice a semester	12	17.4
	Monthly/biweekly	9	13.0
	Weekly	29	42.0
Total		69	100.0

Demographics of Study Area and Participating Schools

Students from 10 secondary schools, and Eco-club, (all in one school board in Ontario) and an after school teen organisation participated in the survey (a few of the students in the after school teen organisation attended other schools outside of the main school board used for this study). The characteristics of the schools are outlined in this section. The following variables: school locations—urban/county schools, schools'

EcoSchools status and EcoSchools level of certification are presented. Table 4.5 depicts the participating schools and the locations and the number of students from each school.

Table 4.5

School Id, School Location (Urban/County,) and Total Number of Participants

		School Location		
		Urban	*County*	*Participants*
SCHOOL ID	1.0		*	54
	2.0		*	38
	3.0	*		65
	4.0	*		65
	5.0		*	46
	6.0		*	71
	7.0	*		27
	8.0		*	72
	9.0		*	80
	10.0	*		67
	11 (Eco-Club)	*		15
	12 (Teen Organisation)	*		21
Total		260 (41.9%)	361 (58.1%)	621

School location: City and County. Of the 10 schools that participated in the survey, five were located in the county while the remaining five were all in the city (urban). The after school teen organisation was also located in the city (see Tables 4.6 for the location distribution of all participating schools).

Table 4.6

School Location (City/County)and Their Sample Size

		Sample Size	*Percent*	*Valid Percent*
Valid	City Schools	260	41.6	41.9
	County Schools	361	57.8	58.1
	Total	621	99.4	100.0
Missing		4	0.6	
Total		625	100.0	

Schools' EcoSchools' status. The 10 schools that participated in the study, eight were certified EcoSchools with either a gold or silver levels of certification or two were non-EcoSchools. Three schools are certified gold level (schools 3, 4 and 5), five were

certified silver level schools (schools 1, 6, 7, 8, and 10), two were non-EcoSchools (schools 2 and 9), and school 11 was an Eco-club in school. School 12 is an after school teen organisation, and non-EcoSchools but with students who attended schools that were both certified and non-certified EcoSchools (see Table 4.7).

Table 4.7

School's ID, EcoSchools Status and Level of Certification

SCHOOLS' ID	*EcoSchools Status*	*Level of Certification*
1.0	ES	Silver
2.0	NES	-
3.0	ES	Gold
4.0	ES	Gold
5.0	ES	Gold
6.0	ES	Silver
7.0	ES	Silver
8.0	ES	Silver
9.0	NES	-
10.0	ES	Silver
11.0 (Eco-Club)	ES	Silver
12.0 (Teen Organisation)	MIX	MIX

Note. SCH = Schools; ES = EcoSchools; NES = Non EcoSchools; Mix= comprised of students from both EcoSchools and non-EcoSchools.

More than three quarters (78.6%) of the Participants were from EcoSchools and 21.4% were from non-EcoSchools (see Table 4.8.).

Table 4.8**.**

Distribution of Participants By EcoSchools Status

ECOSCHOOLS STATUS		*Frequency*	*Percent*	*Valid Percent*
	EcoSchools	488	78.1	78.6
	Non-EcoSchools	133	21.3	21.4
	Total	621	99.4	100.0
Missing		4	0.6	
Total		625	100.0	

Schools' level of certification. Finally, participants were grouped based on their schools level of certification (see Table 4.9). 49.3% of the participants attended a silver certified EcoSchools, 28.8% attended a gold certified EcoSchools and 21.3% were students in non-EcoSchools (or no level of certification).

Table 4.9.

Participants Distribution Based on EcoSchools Level of Certification

EcoSchools Level of Certification		*Frequency*	*Percent*	*Valid Percent*
	Non EcoSchools	133	21.3	21.4
	Gold	180	28.8	29.0
	Silver	308	49.3	49.6
	Total	621	99.4	100.0
Missing		4	0.6	
Total		625	100.0	

Other EcoSchool Factors

Other factors displayed in this section include: students' knowledge of their schools' EcoSchools status and level of certification, students awareness of the EcoSchools program in their schools, the prominence and visibility of the EcoSchools Program in schools and students sources of environmental knowledge.

Students' knowledge of their schools' EcoSchools' status. Students were asked if their schools were one of the EcoSchools. There were 597 useable responses. Among these, 78.4% of the students were in EcoSchools (468 students) 21.6% were in Non-EcoSchools (129 students).

Among the students in the EcoSchools, 47% of them were knowledgeable about their school status as an EcoSchools while 52.3% were not aware of the fact that their school was among the EcoSchools. Among the non-EcoSchools, 16.3% were aware that their school was not a certified EcoSchools, while 83.7% were not aware of this fact (see Table 4.10).

Table 4.10.

EcoSchools Status Versus Students' Knowledge of EcoSchools Status

		Knowledge of EcoSchools Status		
		Knowledgeable	Not Knowledgeable	Total
ECOSCHOOL STATUS	EcoSchools	223 (47.6%)	244 (52.3%)	468
	Non-EcoSchools	21(16.3%)	106 (83.7%)	129
Total		244	350	597

Students' knowledge of EcoSchools' level of certification. Students were asked their school's level of certification. There were 469 responses among schools that had EcoSchools certification (gold or silver). Only 14.3% of the students were able to tell their schools' level of certification (see Table 4.11.).

Table 4.11.

Student's Knowledge of the school's EcoSchools Level of Certification

	Knowledge of EcoSchools Level of Certification		
	Knowledgeable	Not Knowledgeable	Total
EcoSchools	67 (14.3%)	402 (85.7%)	469

Among schools that had gold level certification, 32% of the students knew their schools' level of certification while only 4% of the students in the schools with silver certification knew their level of certification. Sixty seven percent of the students in gold certified schools were not knowledgeable of their schools level of certification while 95.7% of students in schools with silver certification were not knowledgeable of their schools level of certification (see Table 4.12).

Table 4.12.

EcoSchools Level of Certification Versus Knowledge of EcoSchools Level of Certification

		Know Of EcoSchools Level of Certification		
		Knowledgeable	Not Knowledgeable	Total
Schools Level Of Certification	Gold	54 (32.3%)	113 (67.7%)	167
	Silver	13 (4.3%)	289 (95.7%)	302
Total		67	402	469

Students' awareness of the EcoSchools program. Students' awareness of the EcoSchools program for each school was determined by adding the scores from items 15, 16, 17, 18, 19, 20, 22, 24, and 25 from the EcoSchools Questionnaire (see Appendix C). The total score (13) was converted to a percentage for uniformity and grouped as levels for interpretation. The average awareness scores of each participating school are displayed in Table 4.13. The average score for all participants was 60.10%.

Table 4.13

EcoSchools Awareness (%) Grouped by Participating Schools

School ID	*Mean*	*N*	*SD*	*Median*	*Min.*	*Max.*	*Range*
1.00	61.82	54.00	18.48	61.54	23.08	92.31	69.23
3.00	59.31	62.00	25.47	61.54	0.00	100.00	100.00
4.00	62.35	57.00	18.31	61.54	15.38	92.31	76.92
5.00	75.90	45.00	22.04	84.62	30.77	100.00	69.23
6.00	52.44	71.00	24.72	53.85	0.00	92.31	92.31
7.00	70.66	27.00	17.60	69.23	23.08	92.31	69.23
8.00	61.99	68.00	17.68	61.54	30.77	92.31	61.54
10.00	51.09	67.00	20.47	53.85	0.00	84.62	84.62
11.00	57.44	15.00	29.49	61.54	7.69	92.31	84.62
12.00	38.46	5.00	14.39	38.46	23.08	61.54	38.46
Total	60.10	471.00	22.47	61.54	0.00	100.00	100.00

Students in Schools with silver certifications scored an average of 57.32% for awareness while students in schools with gold certification scored an average of 65.11% for awareness (see Table 4.14).

Table 4.14

EcoSchools Awareness (%) Grouped by Schools' Certification Levels

ECOSCH LEVEL OF CERFICATION	*Mean*	*N*	*SD*	*Median*	*Min.*	*Max.*	*Range*
Silver	57.32	303.00	21.50	61.54	0.00	92.31	92.31
Gold	65.11	168.00	23.36	69.23	0.00	100.00	100.00
Total	60.10	471.00	22.47	61.54	0.00	100.00	100.00

EcoSchools awareness was also grouped by students' grade level. The grade 9 had a mean score of 48.6%, grade 10 mean score was 61.9%, the grade 11 mean was 55.2%, grades 12 mean was 64.3, and the grade 13 had a mean of 46.15%. Mean of EcoSchools awareness score is displayed in Table 4.15.

Table 4.15

EcoSchools Awareness (%) Grouped by Students' Grade Level

GRADES	*Mean*	*N*	*SD*	*Median*	*Min*	*Max.*	*Range*
9	48.56	16.00	19.61	50.00	0.00	84.62	84.62
10	61.86	144.00	19.25	65.38	0.00	92.31	92.31
11	55.15	148.00	24.79	61.54	0.00	100.00	100.00
12	64.29	162.00	22.14	61.54	7.69	100.00	92.31
13	46.15	1.00	-	46.15	46.15	46.15	0.00
Total	60.10	471.00	22.47	61.54	0.00	100.00	100.00

EcoSchools awareness was then classified as levels using the criteria displayed in Table 4.16. Awareness interpretation ranges from extremely low level of awareness (below level 1) for scores less than 50% to excellent level of awareness (level 4) for scores greater than 80%.

Table 4.16

Scoring Protocol for Student Awareness Items

SCORE RANGE	LEVEL	INTERPRETATION
<50%	0	Extremely low level of awareness (limited)
50 – 59%	1	Low level of awareness (low)
60 – 69%	2	Fair Level of awareness (moderate)
70 – 79 %	3	Good level of awareness (high)
> 80%	4	Excellent level of awareness (very high)

Among the schools with the EcoSchools status (488 cases), 469 cases were useable. From the 469 cases, 31.6% of the students had level 0, while 10.7% of them had level 2. More than half of the students (57.8%) had level 2 to 4 (see Table 4.17 for a summary of students' awareness levels).

Table 4.17

Students' Level of Awareness of the EcoSchools Program in the Schools

	EcoSchools Awareness Level (0-4)					
	0.0	1.0	2.0	3.0	4.0	Total
Count	148	50	117	59	95	469
	31.6%	10.7%	24.9%	12.6%	20.3%	100.0%

Students' EcoSchools awareness level was also summarized based on their schools level of certification. There were two levels of certifications among the participating schools – gold and silver. Among the schools with the gold certification, 58.7% of the students had a level 2 or below awareness of the EcoSchools program while 41.3% of them had a level 3 and above awareness of the EcoSchools program in their schools.

Students' Level of Awareness of the EcoSchools Program by schools' level of certification. Among the schools with silver certification, 71.9% of the student had a

level 2 or below awareness of the EcoSchools program while 28.1% of the students had a level 3 or higher awareness of the EcoSchools program in their schools (see Table 4.18).

Table 4.18

Students' EcoSchools Awareness Level (0-4)by Schools' Level of Certification

			EcoSchools Awareness Level (0-4)					
			0.0	*1.0*	*2.0*	*3.0*	*4.0*	*Total*
LEVEL OF CERFICATION	Gold	Count	43	17	38	17	52	167
		%	25.7%	10.2%	22.8%	10.2%	31.1%	100.0%
	Silver	Count	105	33	79	42	43	302
		%	34.8%	10.9%	26.2%	13.9%	14.2%	100.0%
Total		Count	148	50	117	59	95	469
		%	31.6%	10.7%	24.9%	12.6%	20.3%	100.0%

Students' level of EcoSchools' awareness by grade level. Students' EcoSchools awareness level was also classified by students' grade level (see Table 4.19). For grades 9, 93.3% of the students had a level 2 or lower awareness of the EcoSchools program. Among the grade 11, 75.6% of the students had a level 2 or lower. Next, 66% of grades 10 students had an awareness level of level 2 or lower and finally, 57.7% of grades 12 pupils had a level 2 or lower.

Table 4.19

Students' Level of Awareness of the EcoSchools Program by Grade Levels

			EcoSchools Awareness Level (0-4)					
			0.0	*1.0*	*2.0*	*3.0*	*4.0*	*Total*
GRADE	9	Count	7	2	5	0	1	15
		%	46.7%	13.3%	33.3%	0.0%	6.7%	100.0%
	10	Count	42	17	36	23	26	144
		%	29.2%	11.8%	25.0%	16.0%	18.1%	100.0%
	11	Count	56	15	41	13	23	148
		%	37.8%	10.1%	27.7%	8.8%	15.5%	100.0%
	12	Count	42	16	35	23	45	161
		%	26.1%	9.9%	21.7%	14.3%	28.0%	100.0%
	13	Count	1	0	0	0	0	1
		%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Total		Count	148	50	117	59	95	469
		%	31.6%	10.7%	24.9%	12.6%	20.3%	100.0%

EcoSchools' prominence. The prominence of the EcoSchools program (i.e., how much the teachers talk about the EcoSchools, posters and notice boards encouraging good environmental behaviour) was determined by adding the scores from items 10, 11, 12, 13, 14, 21 and 23 from the EcoSchools Questionnaire (see Appendix C). The score was converted to percentage and levels. There were 473 useable cases. The average percentage score for schools was 35.99%. Prominence level was classified using the classification levels in the Table 4.20.

Table 4.20

EcoSchools Prominence Interpretation Table

SCORE	LEVEL	INTERPRETATION
<50%	0	Lacking prominence
50 – 59%	1	limited prominence
60 – 69%	2	Fairly prominent
70 – 79 %	3	Very prominent
> 80%	4	Highly prominent

EcoSchools' prominence by students' grade level. From the students score on the prominence items, more than 90% of students across grade levels scored at a level 2 or lower. Notably, all the grade 9 students scored a level 0. Overall, 84.2% of the students across grades scored at level 1 or zero in EcoSchools prominence (see Table 4.21 for the summary of prominence score across grades).

Table 4.21

Students EcoSchools Prominence Rating by Grades Level

			EcoSchools Prominence Level (0-4)					
			0.0	*1.0*	*2.0*	*3.0*	*4.0*	*Total*
GRADES	9	Count	15	0	0	0	0	15
			100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	10	Count	117	14	10	1	4	146
			80.1%	9.6%	6.8%	0.7%	2.7%	100.0%
	11	Count	93	18	27	9	2	149
			62.4%	12.1%	18.1%	6.0%	1.3%	100.0%
	12	Count	124	15	14	6	2	161
			77.0%	9.3%	8.7%	3.7%	1.2%	100.0%
	13	Count	1	0	0	0	0	1
			100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Total		Count	350	47	51	16	8	472
			74.2%	10.0%	10.8%	3.4%	1.7%	100.0%

EcoSchools' prominence by schools' level of certification. When EcoSchools prominence score was group by schools' level of certification, 95.8% of the students in gold certified schools scored a level 2 or lower and 94.5% of students in silver certified schools scored a level two or lower. The distribution of students' scores in the EcoSchools prominence items by grade levels is presented in Table 4.22.

Table 4.22

Student's EcoSchools Prominence Ratings by Schools Level of Certification

			EcoSchools Prominence Level (0-4)					
			0.0	*1.0*	*2.0*	*3.0*	*4.0*	Total
ECOSCH LEVEL OF CERFICATION	Gold	Count	127	14	20	4	3	168
		%	75.6%	8.3%	11.9%	2.4%	1.8%	100.0%
	Silver	Count	223	33	31	12	5	304
		%	73.4%	10.9%	10.2%	3.9%	1.6%	100.0%
Total		Count	350	47	51	16	8	472
		%	74.2%	10.0%	10.8%	3.4%	1.7%	100.0%

EcoSchools' visibility: Awareness & prominence. The visibility of the EcoSchools program was determined by adding the scores from items 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, and 25 from the EcoSchools Questionnaire. These items are the sum total of EcoSchools awareness and prominence scores. The total score was

converted to percentage and levels (see Table 4.23). The average percentage score for visibility for all schools was 48%.

Table 4.23

EcoSchools Visibility Interpretation

SCORE	LEVEL	INTERPRETATION
<50%	0	Almost invisible
50 – 59%	1	limitedly visible
60 – 69%	2	Fairly visible
70 – 79 %	3	Very visible
> 80%	4	Highly visible

EcoSchools' visibility: Awareness & prominence grouped by students' grade levels. EcoSchools visibility scores were grouped by students' grade level. In grade 9, 100% of the students scored in the level 1 or lower on the visibility scale. While 93.2% of the grades 10 students score a level 1 or lower. Finally, 87% of the grade 11 students and 90.6% of grade 12 students all scored within the level 2 or lower of the EcoSchools visibility scale. A summary of the results are presented in Table 4.24.

Table 4.24

Students' EcoSchools Visibility Rating by Grade Levels

			EcoSchools Visibility Level (0-4)					
			0.0	*1.0*	*2.0*	*3.0*	*4.0*	Total
GRADES	9	Count	13	2	0	0	0	15
		%	86.7%	13.3%	0.0%	0.0%	0.0%	100.0%
	10	Count	71	40	24	6	4	145
		%	49.0%	27.6%	16.6%	4.1%	2.8%	100.0%
	11	Count	69	34	25	12	7	147
		%	46.9%	23.1%	17.0%	8.2%	4.8%	100.0%
	12	Count	73	43	30	9	6	161
		%	45.3%	26.7%	18.6%	5.6%	3.7%	100.0%
	13	Count	1	0	0	0	0	1
		%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Total		Count	227	119	79	27	17	469
		%	48.4%	25.4%	16.8%	5.8%	3.6%	100.0%

EcoSchools' visibility: Awareness & prominence classified by schools level of certification. For the visibility scores, the percentage of students in schools with gold and

silver certification that scored at level 2 or less were 87.2% and 92.5% respectively (see Table 4.25 for a summary of students' visibility scores).

Table 4.25

Students EcoSchools Visibility Rating by Schools Level of Certification

			EcoSchools Visibility Level (0-4)					
			0.0	*1.0*	*2.0*	*3.0*	*4.0*	Total
ECOSCHOOL LEVEL OF CERFICATION	Gold	Count	73	39	32	11	10	165
		%	44.2%	23.6%	19.4%	6.7%	6.1%	100.0%
	Silver	Count	154	80	47	16	7	304
		%	50.7%	26.3%	15.5%	5.3%	2.3%	100.0%
Total		Count	227	119	79	27	17	469
		%	48.4%	25.4%	16.8%	5.8%	3.6%	100.0%

Students' Source of Environmental Knowledge

Student participants were asked the extent to which various sources of environmental information contributed to their own environmental knowledge on a scale 0-5. Sources of environmental knowledge included were; television (students were asked to specify the exact program), school subjects (students were asked to specify the subject), EcoSchools club, books, Web/internet, other environmental clubs, friends and other sources (students were asked to specify). Students' source of environmental knowledge is summarized in Table 4.26.

Table 4.26

Source of Environmental Knowledge

	No Extent 0)	Some Extent (1)	Moderate Extent (2)	Large Extent (3)	Great Extent (4)
Television	73 (12%)	132 (21.1%)	204 (33.6%)	126 (20.7%)	73 (12%)
School Subjects	24 (4%)	58 (9.6%)	169 (27.9%)	209 (34.5%)	146 (24.1)
EcoSchools Club	407 (67.3%)	85 (14%)	57 (9.4%)	31 (4.1%)	25 (4.1%)
Books	148 (24.5%)	181 (29.9%)	158 (26.1%)	84 (13.9%)	34 (5.6%)
Web/Internet	41 (6.8%)	94 (15%)	150 (24.8%)	179 (29.6%)	141 (23.3%)
Other Environmental Club	476 (78.7%)	44 (7.3%)	49 (8.1%)	15 (2.5%)	21 (3.5%)
Friends	199 (32.9%)	201 (33.3%)	128 (21.2%)	48 (7.9%)	28 (4.6%)
Other Sources	503 (83.3%)	31 (5.1%)	34 (5.6%)	17 (2.8%)	19 (3.1%)

EL Concepts Scores, Distribution and Summary

The MSELS measured eight scales of EL. The scales were "Ecological Foundations" (17 marks), "How you Think about the Environment" (60 marks), "What You do About the Environment" (60 marks), "You and Environmental Sensitivity" (55 marks), "How you Feel about the Environment" (10 marks), "Issue Identification" (3 marks), "Issue Analysis" (6 marks), and "Action Planning" (20 marks) to make up the total score for the EL survey (231 marks). The items completion trend graph for the components is presented in *Figure* 4.1. There number of items completed decrease with each succeeding sections.

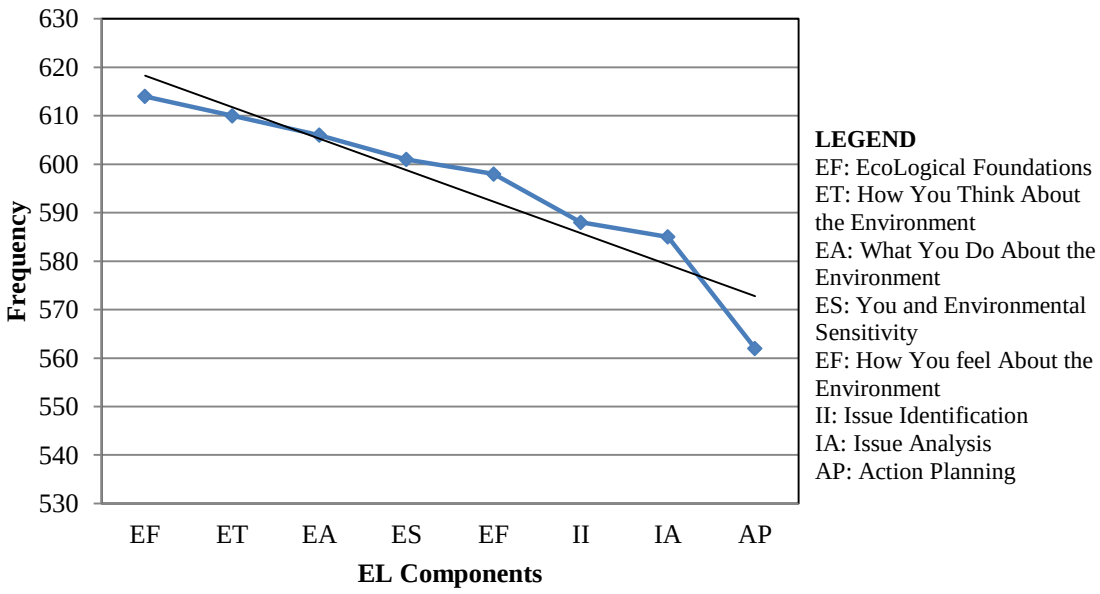

Figure 4.1. Items Completion Trends for the EL Components

In this section, summary of scores for each of the MSELS sections are presented as percentages for easy comparison across scales. The mean scores of student in the eight scales of the MSELS (Ecological Foundations, EF; Environmental Thoughts, ET; Environmental Actions, EA; You and Your Environmental Sensitivity, ES; Environmental Feeling, EF; Issue Identification, II; Issue Analysis, IA; and Action Planning, AP) were displayed and compared by all participants and five independent variables:

1. All participants (see Table 4.27);
2. Participating schools (ten schools, teen organisation and an Eco-Club) see Table 4.28;
3. Students' grade levels (grades 7-13), see Table 4.29;

4. Schools' location (city and county), see Table 4.30;
5. Schools' EcoSchools status (EcoSchools and non-EcoSchools), see Table 4.31; and
6. Schools' level of certification (non-EcoSchools, gold and silver certified schools), see Table 4.32.

Overall, students' average was highest on EF concepts of section of the MSELS (83.04%) and lowest on the II concept (41%) (see Table 4.27). The general statistics and distribution of each of the concepts measured by the MSELS are displayed in *Figure* 4.27 to 4.32.

Table 4.27

*Mean of EL Concepts Raw Scores (*MSELS*)*

	Mean	N	*SD*	*Range*	*Skewness*	*Min*	*Max*
EF (%)	77.05	614.00	19.88	94.12	-1.09	5.88	100.00
ET (%)	71.01	610.00	12.67	71.67	-0.51	25.00	96.67
EA (%)	63.79	606.00	13.19	68.33	-0.30	26.67	95.00
ES (%)	54.29	601.00	13.28	80.00	0.28	20.00	100.00
EF (%)	83.04	598.00	17.98	90.00	-0.90	10.00	100.00
II (%)	41.21	588.00	32.50	100.00	0.21	.00	100.00
IA (%)	55.36	585.00	35.49	100.00	-0.11	.00	100.00
AP (%)	45.05	562.00	27.52	100.00	0.12	.00	100.00

Table 4.28

EF, ET, EA, ES, EF, II, IA and AP Raw Scores Grouped by Participating Schools

School Id	STAT.	EF (17)	ET (60)	EA (60)	ES (55)	EF (10)	II (3)	IA (6)	AP (20)
1.0	*Mean*	83.55	71.02	62.62	54.07	85.37	51.85	65.12	56.48
	SD	12.64	11.71	13.30	15.44	18.91	36.44	37.93	54
	N	54	54	54	54	54	54	54	26.77
2.0	*Mean*	73.37	65.27	61.13	55.09	82.16	32.38	48.57	40.88
	SD	27.17	13.93	12.08	11.10	17.82	33.81	38.21	24.32
	N	38	37	37	37	37	35	35	34
3.0	*Mean*	70.78	68.66	59.94	52.91	78.03	31.15	42.35	35.64
	SD	22.14	14.28	15.10	14.40	19.73	32.70	36.46	25.48
	N	61	61	61	61	61	61	61	55
4.0	*Mean*	79.23	66.28	59.06	52.02	81.91	41.94	56.67	49.20
	SD	19.41	12.32	13.71	12.66	14.69	33.02	33.22	31.39
	N	64	64	64	64	63	62	60	56
5.0	*Mean*	80.82	75.72	67.68	57.98	91.52	52.59	68.15	47.67
	SD	19.59	11.43	10.59	13.81	12.29	35.88	34.23	26.75
	N	46	46	46	46	46	45	45	45
6.0	*Mean*	78.52	74.42	66.40	52.73	86.81	46.86	69.57	45.07
	SD	15.43	11.94	12.27	12.07	13.56	28.76	30.91	26.55
	N	69	69	69	69	69	69	69	69
7.0	*Mean*	86.27	73.72	64.68	53.50	89.62	60.26	81.41	46.54
	SD	17.27	11.10	16.66	12.48	12.48	24.98	23.72	22.13
	N	27	26	26	26	26	26	26	26
8.0	*Mean*	76.23	73.89	66.99	54.49	84.03	40.85	49.06	46.69
	SD	17.70	11.46	12.13	12.72	18.44	29.92	33.68	27.39
	N	72	72	72	72	72	71	71	71
9.0	*Mean*	77.21	68.01	62.59	50.77	80.92	37.23	48.68	46.03
	SD	19.64	12.98	13.10	13.49	18.63	32.88	33.31	29.84
	N	80	79	78	78	76	77	76	73
10.0	*Mean*	77.26	71.41	64.55	56.99	79.34	33.94	48.15	39.36
	SD	16.70	12.76	12.76	15.46	20.73	55	34.52	25.74
	N	67	66	63	61	61	27.59	54	47
Eco-Club	*Mean*	89.02	81.89	70.11	55.32	90.00	53.85	71.79	52.27
	SD	10.40	7.37	11.99	11.91	17.10	13	29.96	26.68
	N	15	15	15	14	14	25.60	13	11
Teen Org	*Mean*	46.50	69.84	65.48	61.04	66.32	15.00	23.02	28.57
	SD	21.44	7.62	9.415	15.01	21.66	17.01	18.62	22.87
	N	21	21	21	21	19	20	21	21

Table 4.29

EF, ET, EA, ES, EF, II, IA and AP Students' Raw Scores Grouped by Students' Grades Level

GRADE		***EF (17)***	***ET (60)***	***EA (60)***	***ES (55)***	***EF (10)***	***II (3)***	***IA (6)***	***AP (20)***
Grade 7 & 8	*Mean*	51.47	72.08	62.92	54.09	82.50	16.67	29.17	13.75
	SD	10.05	13.01	11.89	24.46	20.62	19.25	25.00	7.50
	N	4	4	4	4	4	4	4	4
Grade 9	*Mean*	49.62	63.04	57.25	53.60	66.19	27.27	30.43	29.78
	SD	22.84	10.96	13.95	14.42	21.56	36.57	25.45	25.11
	N	23	23	23	23	21	22	23	23
Grade 10	*Mean*	77.31	70.76	64.15	53.77	82.97	40.56	52.83	45.67
	SD	19.34	11.97	12.63	12.61	17.29	31.30	34.25	27.89
	N	232	231	230	230	229	226	224	217
Grade 11	*Mean*	79.97	72.97	64.13	55.26	84.29	43.10	58.44	43.88
	SD	16.78	13.12	164	13.74	17.41	32.74	34.52	26.01
	N	168	166	13.07	160	161	157	156	147
Grade 12	*Mean*	78.39	70.59	63.81	54.17	83.83	42.99	59.81	48.21
	SD	19.90	12.96	13.87	13.47	18.13	33.26	37.70	28.06
	N	184	183	182	181	180	176	175	168
Grade 13	*Mean*	70.59	75.83	69.17	59.09	100.00	16.67	66.67	55.00
	SD	.00	5.89	17.68	3.86	.00	23.57	23.57	7.07
	N	2	2	2	2	2	2	2	2

Table 4.30

EF, ET, EA, ES, EF, II, IA and AP Raw Scores Summarised by Schools' Location

SCHOOLS LOCATION		***EF (17)***	***ET (60)***	***EA (60)***	***ES (55)***	***EF (10)***	***II (3)***	***IA (6)***	***AP (20)***
City	*Mean*	75.32	70.18	62.45	54.80	80.37	37.69	37.69	41.44
	SD	21.37	12.75	14.02	13.70	18.86	31.36	31.36	27.31
	N	255	253	250	246	244	237	237	216.00
County	*Mean*	78.27	71.60	64.73	53.94	84.89	43.71	43.71	47.45
	SD	18.69	12.60	12.52	12.99	17.14	33.05	33.05	27.37
	N	359	357	356	355	354	350	350	345.00

Table 4.31

EF, ET, EA, ES, EF, II, IA and AP Raw Scores Summarised By Schools' Location

ECOSCHOOLS STATUS		***EF (17)***	***ET (60)***	***EA (60)***	***ES (55)***	***EF (10)***	***II (3)***	***IA (6)***	***AP (20)***
EcoSchools	*Mean*	78.28	71.99	64.16	54.37	83.86	43.36	58.02	41.44
	SD	18.43	12.47	13.35	13.44	17.63	32.24	459	27.31
	N	481	479	476	472	472	462	35.40	216.00
Non-EcoSchools	*Mean*	72.58	67.42	62.42	53.55	80.00	33.33	45.63	47.45
	SD	23.98	12.81	12.55	12.70	19.02	32.39	34.20	27.37
	N	133	131	130	129	126	126	126	345.00

Table 4.32

EF, ET, EA, ES, EF, II, IA and AP Raw Scores Summarised by Schools' Level of Certification

LEVEL OF CERFICATION		***EF (17)***	***ET (60)***	***EA (60)***	***ES (55)***	***EF (10)***	***II (3)***	***IA (6)***	***AP (20)***
Non-EcoSchools	*Mean*	72.58	67.42	62.42	53.56	79.37	33.33	45.63	41.97
	SD	23.98	12.81	12.55	12.71	19.02	32.39	34.20	28.12
	N	133	131	130	129	126	126	126	122
Gold Schools	*Mean*	76.97	69.77	61.81	53.91	82.99	40.89	54.61	44.19
	SD	20.72	13.22	13.80	13.63	16.91	34.40	36.22	28.76
	N	175	175	175	175	174	172	170	160
Silver Schools	*Mean*	79.03	73.27	65.53	54.83	84.36	44.83	60.03	46.89
	SD	16.97	11.84	12.91	13.34	18.05	30.85	34.82	26.48
	N	306	304	301	297	298	290	289	280

EL Components and Combined Scores

The total EL scores (231 marks) and the individual EL components were converted to weighted percentages. The scores were converted to weighted percentages for the following reasons:

1. Uniformity and ease of comparison between the other components and variables.
2. To remove lop-sided effect that will be caused by sections in the MSELS with more items and higher scores.
3. To recognise the strength of each EL component measured with the MSELS.
4. Finally, to reflect the recommendation made by the designers of the MSELS (McBeth, et al., 2008), who recommended that sections should be weighted to account for non-uniformity of the number of items in each category.

The percentage distribution of each category and components are displayed in Table 4.33. Results are presented under five independent variables headings:

1. Participating schools;
2. Students' grade levels – grades 7-13;

3. Schools location – city and county schools;
4. Schools EcoSchools – EcoSchools and non-EcoSchools; and
5. Schools' level of certification - non-EcoSchools (no certification), gold and silver certified schools).

Table 4. 33

Multiplier Factor and Weight for EL components and MSELS Scales.

Environmental Literacy Component	**MSELS Scales**	**Max Total Scores**	**Weight**	**Factor***
Environmental Knowledge	Ecological Foundations	17	25%	1.47
Environmental affects	How You Think About the Environment	60	12%	0.2
	You and Environmental sensitivity	55	11%	0.2
	How You Feel About the Environment	10	2%	0.2
Environmental responsible behaviour	What you do about the environmental	60	25%	0.416
Environmental skills	Issue identification	3	2.6%	0.862
	Issue analysis	6	5.2%	0.862
	Action planning	20	17.2%	0.862
TOTAL		231	100%	

Combined EL. The overall EL mean for all participating schools was 62.71%. The minimum score was 26.59% and maximum score was 91.77%. Among the EL components, students posted the highest mean on environmental knowledge (77.01%) and the least mean among components was observed in the environmental skills category (45.67%) (see Table 4.34 for the summary of the statistics parameter).

Table 4.34

EL Summary for All Participants

		EK (25%)	EA (25%)	ERB (25%)	ES (25%)	EL TOTAL (%)
N	Valid	614	610	606	584	586
	Missing	11	15	19	41	39
Mean		77.01	64.13	63.69	45.67	62.76
Median		82.32	64.80	63.23	48.27	63.31
Mode		88.20	68.00	63.23	68.96	48.83
Std. Deviation		19.88	10.61	13.17	23.98	10.97
Skewness		-1.09	-.43	-.30	.01	-.21
Kurtosis		.54	.60	-.08	-.98	-.33
Minimum		5.88	24.00	26.62	.00	26.59
Maximum		99.96	91.20	94.85	99.99	91.77

EK – Environmental Knowledge; EA – Environmental Affect; ERB – Environmental Responsible Behaviour; ES – Environmental Skills.

The distribution curves for the scores are presented in *Figure*s 4.2-4.6. The EK, EA, ERB, and ES and the overall EL mimic the bell curve. The ES scores are positively skewed while EK, EA, ERB and EL scores are negatively skewed. This implies that for ES, a larger percentage of students had lower than average scores while for EK, EA, ERB and EL, a greater number of students had higher than average scores.

However, the degree of skewness (deviation from the normal distribution) varied. EK, EA, ERB, ES and EL had skewness values of -1.09, -0.43, -0.3, +0.01 and -0.21 respectively. The skewedness values indicated that the largest number of participants scored than the observed average was in the EK component.

In the ES score, the positive skewness indicated that a larger number of students scored lower than the average. A test of normality using the Shapiro-Wilk indicated that EK, EA, ERB and EL were not a normal distribution. However, the overall EL normality value (Shapiro-Wilk) was 0.993. A value of 1.0 is considered perfect; which would imply that the data perfectly mimics a normal curve.

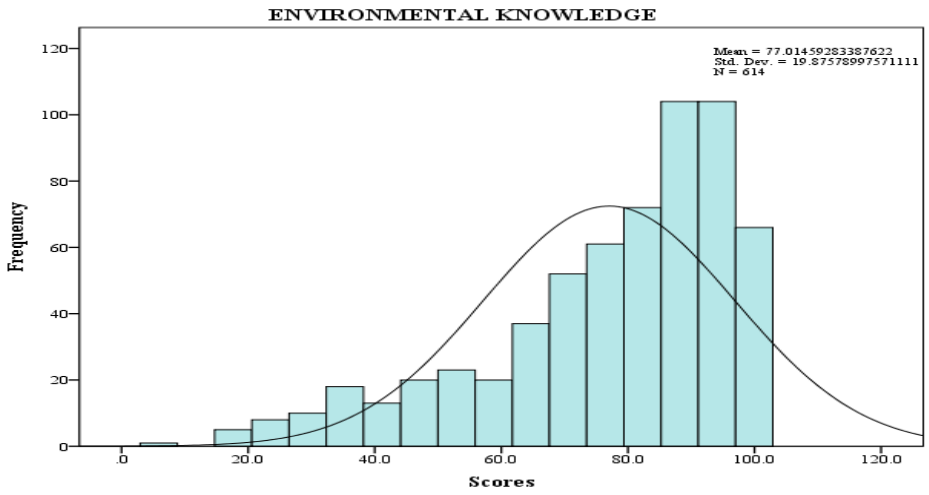

Figure 4.2. Frequency Distribution Curve— Environmental Knowledge

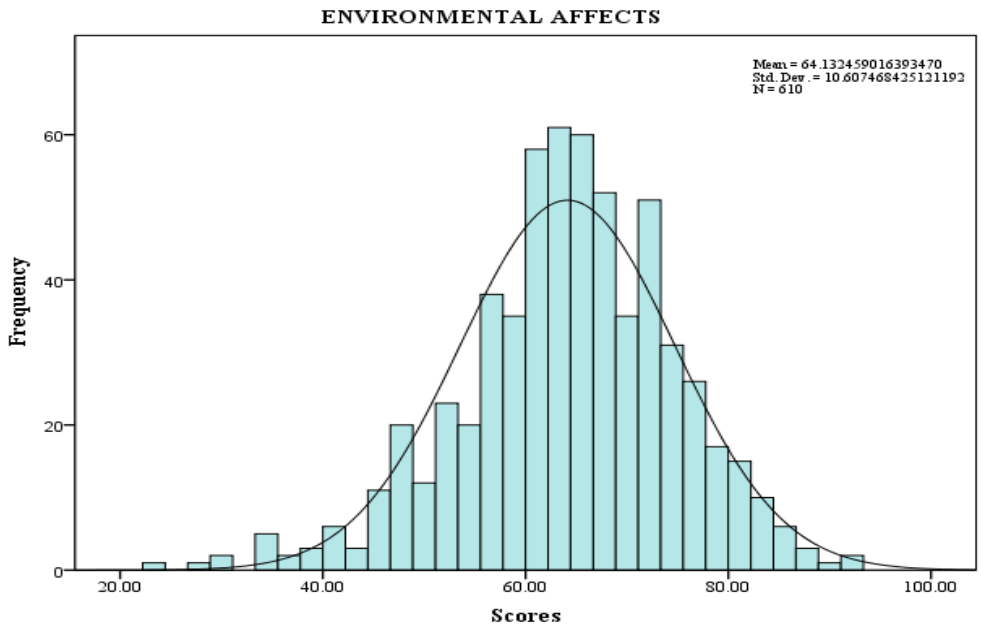

Figure 4.3. Frequency Distribution Curve—Environmental Affects

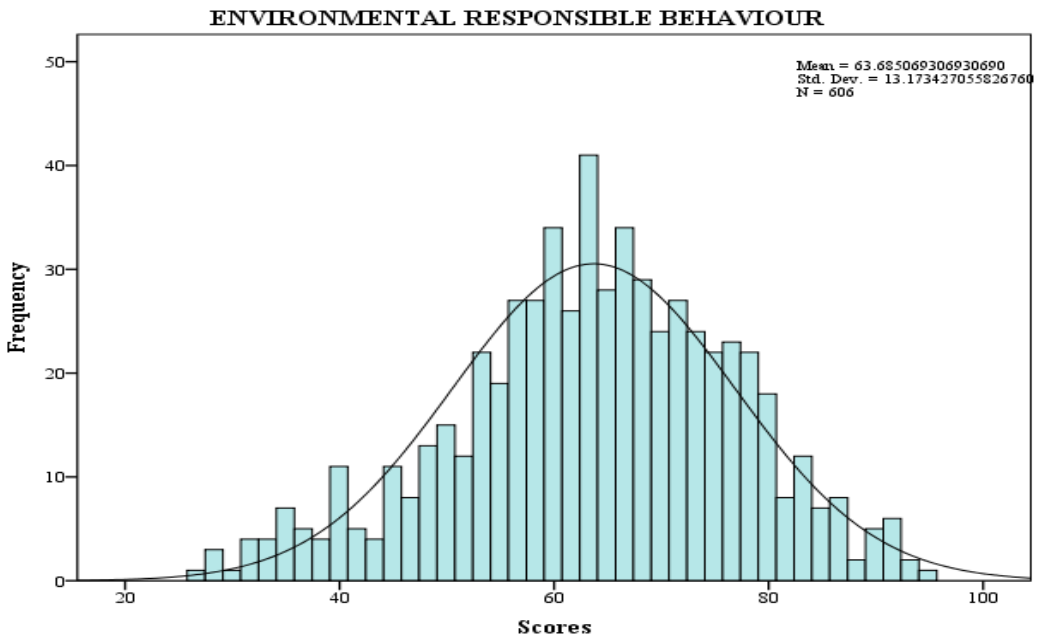

Figure 4.4. Frequency Distribution Curve – Environmental Responsible Behaviour

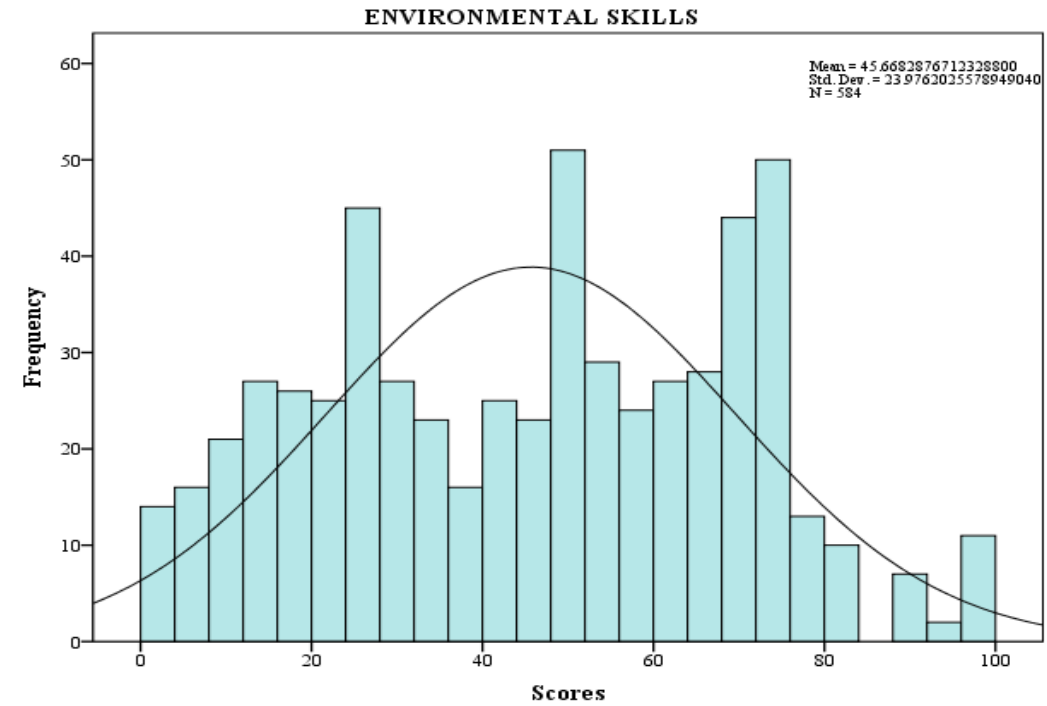

Figure 4.5. Frequency Distribution Curve – Environmental Skills

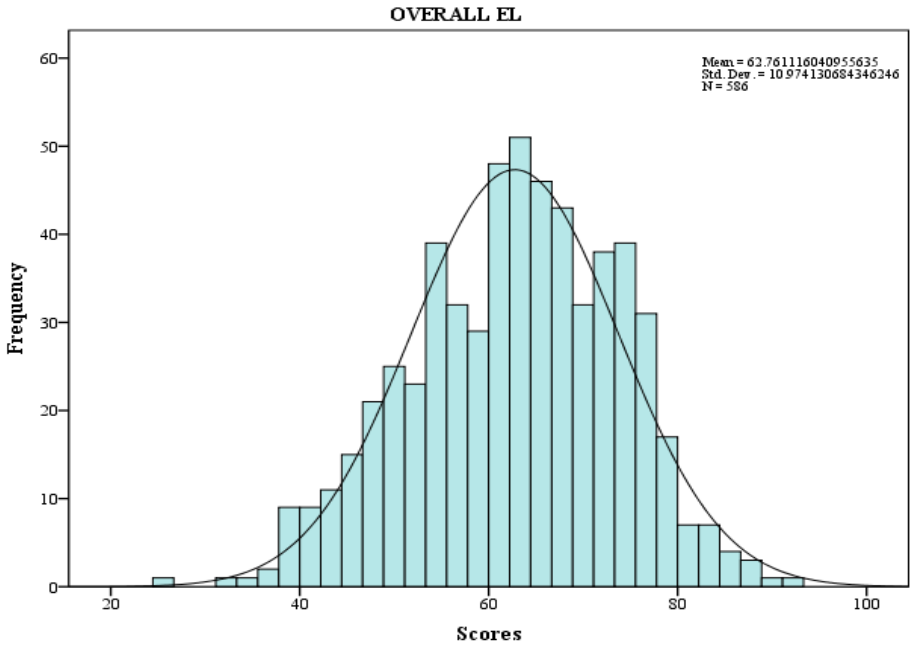

Figure 4.6. Frequency Distribution Curve – Overall EL

Total EL and component scores summarised by participating schools.

Statistics parameters for overall EL scores and components for all participating schools are presented in Table 4.35.

Table 4.35

Mean Components and Overall EL Scores Summarised by Participating Schools.

SCHOOL ID		EK (25%)	EA (25%)	ERB (25%)	ES (25%)	EL TOTAL (100%)
1.0	*Mean*	83.52	64.71	62.52	57.79	67.13
	N	54	54	54	54	54
	SD	12.64	10.71	13.28	22.48	8.97
	Min	41.16	34.40	28.29	.00	39.16
	Max	99.96	88.00	93.18	99.99	85.95
2.0	*Mean*	73.35	62.14	61.03	40.78	59.23
	N	38	37	37	35	37
	SD	27.16	9.42	12.06	24.55	12.80
	Min	5.88	44.80	29.95	.00	38.70
	Max	99.96	84.00	91.52	99.99	83.44
3.0	*Mean*	70.75	62.48	59.85	35.91	56.81
	N	61	61	61	58	61
	SD	22.13	10.44	15.08	23.04	12.33

	Min	17.64	30.40	26.62	.00	26.59
	Max	99.96	85.60	89.86	79.30	78.06
4.0	*Mean*	79.20	61.15	58.97	47.58	61.05
	N	64	64	64	60	64
	SD	19.40	10.22	13.69	25.42	10.16
	Min	23.52	36.80	28.29	.00	37.45
	Max	99.96	85.60	91.52	96.54	85.04
5.0	*Mean*	80.79	69.18	67.57	51.27	67.20
	N	46	46	46	46	46
	SD	19.58	9.57	10.57	25.20	10.28
	Min	17.64	52.00	46.59	.00	38.93
	Max	99.96	89.60	91.52	89.65	88.82
6.0	*Mean*	78.49	65.87	66.29	50.32	65.24
	N	69	69	69	69	69
	SD	15.42	9.18	12.25	20.69	9.96
	Min	35.28	40.00	38.27	10.34	40.97
	Max	99.96	84.00	91.52	99.99	87.43
7.0	*Mean*	86.24	66.09	64.58	55.17	68.40
	N	27	26	26	26	26
	SD	17.26	9.20	16.63	18.06	9.86
	Min	29.40	45.60	34.94	17.24	43.35
	Max	99.96	91.20	93.18	82.75	91.77
8.0	*Mean*	76.20	66.17	66.88	46.57	63.91
	N	72	72	72	71	71
	SD	17.69	9.06	12.11	21.17	10.58
	Min	35.28	48.80	36.61	3.45	39.60
	Max	99.96	91.20	91.52	96.54	89.87
9.0	*Mean*	77.18	60.93	62.49	45.05	61.41
	N	80	79	78	75	75
	SD	19.63	10.65	13.08	24.12	10.57
	Min	17.64	27.20	31.62	6.90	38.87
	Max	99.96	82.40	86.53	96.54	83.16
10.0	*Mean*	77.23	63.32	64.45	36.20	61.58
	N	67	66	63	56	48
	SD	16.69	13.89	12.74	24.40	10.23
	Min	29.40	24.00	33.28	6.90	39.80
	Max	99.96	87.20	89.86	89.65	83.30
Eco-Club	*Mean*	88.98	68.75	70.00	50.92	72.58
	N	15	15	15	13	11
	SD	10.39	10.78	11.97	24.95	6.78
	Min	64.68	39.20	49.92	13.79	61.91
	Max	99.96	85.60	94.85	96.54	84.40
Teen Org	*Mean*	46.48	65.18	65.37	25.94	51.49
	N	21	21	21	21	19
	SD	21.44	8.51	9.40	16.70	7.44
	Min	17.64	49.60	49.92	3.45	41.87
	Max	88.20	84.80	86.53	55.17	64.85
Total	*Mean*	77.01	64.13	63.69	45.67	62.71
	N	614	610	606	584	581
	SD	19.88	10.61	13.17	23.98	11.14

Min	5.88	24.00	26.62	.00	26.59
Max	99.96	91.20	94.85	99.99	91.77

EK = Environmental knowledge (25%); EA = Environmental affects (25%); ERB = Environmental Responsible Behaviour (25%) and ES = Environmental skills (25%).

Total EL and component scores summarised by students' grade level. The mean overall EL scores analysis by grade levels showed that the grades 7/8 posted the lowest mean of 49.13%, while the grade 13 students posted the highest mean of 65.87%. Comparing all the EL components among the various grades, grades 7/8 also posted the lowest mean score on the EL components in environmental skills, 17.24%; grades 9 students posted the lowest mean on environmental knowledge, environmental affect and environmental responsible behaviour—49.60%, 58.68% and 57.15% respectively. The complete statistics parameters for all the grades are presented in Table 4.36.

Table 4.36

Mean Components and Overall EL Scores Summarised by Students Grade Levels

GRADES		EK (25%)	EA (25%)	ERB (25%)	ES (25%)	EL TOTAL (100 %)
7/8	*Mean*	51.45	65.00	62.82	17.24	49.13
	N	4	4	4	4	4
	SD	10.04	14.68	11.87	6.30	4.45
	Min	41.16	49.60	53.25	10.34	43.48
	Max	64.68	84.80	79.87	24.14	54.04
9	*Mean*	49.60	58.68	57.15	30.88	49.23
	N	23	23	23	22	21
	SD	22.83	9.61	13.93	19.43	10.33
	Min	17.64	30.40	28.29	3.45	26.59
	Max	88.20	72.80	86.53	62.06	63.94
10	*Mean*	77.28	64.10	64.05	46.00	62.72
	N	232	231	230	222	227
	SD	19.34	9.68	12.61	22.25	10.34
	Min	5.88	27.20	31.62	.00	38.87
	Max	99.96	91.20	94.85	99.99	87.43
11	*Mean*	79.94	65.00	64.02	45.22	64.21
	N	168	166	164	156	146
	SD	16.77	11.62	13.05	24.08	10.99
	Min	29.40	30.40	29.95	6.90	38.70
	Max	99.96	91.20	93.18	96.54	91.77
12	*Mean*	78.36	64.06	63.71	48.21	63.47
	N	184	183	182	177	180
	SD	19.89	10.72	13.85	25.82	11.18
	Min	17.64	24.00	26.62	.00	33.28
	Max	99.96	86.40	91.52	99.99	89.87
13	*Mean*	70.56	70.40	69.06	53.44	65.87
	N	2	2	2	2	2
	SD	.00	4.53	17.65	2.44	6.15
	Min	70.56	67.20	56.58	51.72	61.51
	Max	70.56	73.60	81.54	55.17	70.22

EK = Environmental knowledge (25%); EA = Environmental affects (25%); ERB = Environmental Responsible Behaviour (25%) and ES = Environmental skills (25%).

Total EL and component scores summarised by city and county schools.

Total EL and components scores were grouped based on schools location; city and county schools. The city schools had an overall mean EL score of 60.62% while the county schools had a mean of 64.07%. The county schools also posted higher mean scores across all the EL components. Complete statistics are displayed in Table 4.37.

Table 4.37

Mean Components and Overall EL Scores Summarised by Schools' Location

SCHOOLS LOCATION		EK (25%)	EA (25%)	ERB (25%)	ES (25%)	EL TOTAL (100 %)
City	*Mean*	75.29	63.33	62.35	41.05	60.62
	N	255	253	250	234	229
	SD	21.36	11.25	14.00	24.42	11.49
	Min	17.64	24.00	26.62	.00	26.59
	Max	99.96	91.20	94.85	96.54	91.77
County	*Mean*	78.24	64.70	64.62	48.75	64.07
	N	359	357	356	350	352
	SD	18.68	10.10	12.50	23.20	10.70
	Min	5.88	27.20	28.29	.00	38.70
	Max	99.96	91.20	93.18	99.99	89.87

EK = Environmental knowledge (25%); EA = Environmental affects (25%); ERB = Environmental Responsible Behaviour (25%) and ES = Environmental skills (25%).

Total EL and component scores summarised by EcoSchools status. Total EL and components scores were grouped based on EcoSchools and non-EcoSchools. The EcoSchools had a mean of 63.56% while the non-EcoSchools had a mean of 59.64%. The EcoSchools also scored consistently higher (EK-78.25%; EA-64.79%; ERB-64.06%; and ES-46.87%) than the non-EcoSchools on all the EL components. Complete statistics results are displayed in Table 4.38.

Table 4.38

Mean Components and Overall EL Scores Summarised by EcoSchools Status

SCHOOLS ECOSCHOOLS STATUS		EK (25%)	EA (25%)	ERB (25%)	ES (25%)	EL TOTAL (100%)
EcoSchools	*Mean*	78.25	64.79	64.06	46.87	63.56
	N	481	479	476	459	456
	SD	18.42	10.63	13.33	23.78	10.92
	Min	17.64	24.00	26.62	.00	26.59
	Max	99.96	91.20	94.85	99.99	91.77
Non-EcoSchools	*Mean*	72.55	61.72	62.32	41.24	59.64
	N	133	131	130	125	125
	SD	23.97	10.21	12.53	24.25	11.44
	Min	5.88	27.20	29.95	.00	38.70
	Max	99.96	84.80	91.52	99.99	83.44

EK = Environmental knowledge (25%); EA = Environmental affects (25%); ERB = Environmental Responsible Behaviour (25%) and ES = Environmental skills (25%).

Total EL and component scores summarised by schools' level of certification. The non-EcoSchools (no certification) posted a mean score of 59.64% in the EL overall score, schools with gold certification averaged 61.36% and schools with silver certification averaged 64.92%. The silver schools also posted a higher mean score across all the components of EL (EK-79%; EA-65.36%; ERB-65.42%; and ES-48%). The complete results of the statistical analysis are displayed in Table 4.39.

Table 4.39

Mean Components and Overall EL Scores Summarised by Schools Level of Certification

LEVEL OF CERTIFICATION		EK (25%)	EA (25%)	ERB (25%)	ES (25%)	EL TOTAL (100 %)
Non-EcoSchools	*Mean*	72.55	61.72	62.32	41.24	59.64
	N	133	131	130	125	125
	SD	23.97	10.21	12.53	24.25	11.44
	Min	5.88	27.20	29.95	.00	38.70
	Max	99.96	84.80	91.52	99.99	83.44
Gold	*Mean*	76.94	63.81	61.71	44.68	61.36
	N	175	175	175	168	175
	SD	20.72	10.52	13.78	25.47	11.69
	Min	17.64	30.40	26.62	.00	26.59
	Max	99.96	89.60	91.52	96.54	88.82
Silver	*Mean*	79.00	65.36	65.42	48.14	64.92
	N	306	304	301	291	281
	SD	16.97	10.67	12.89	22.70	10.19
	Min	23.52	24.00	28.29	.00	39.16
	Max	99.96	91.20	94.85	99.99	91.77

EK = Environmental knowledge (25%); EA = Environmental affects (25%); ERB = Environmental Responsible Behaviour (25%) and ES = Environmental skills (25%).

Total EL and component scores summarised by Gender. For the overall EL score, the average mean of the female students was 63.42% while that of the students was 59.92%. Except in the EK component of the test where the mean of the male students was higher (77.45%) than the female students (76.62); the female students had higher means (EA – 65.70%; ERB – 65.99%; ES – 49.36%) in the other three components of EL than their male counterparts (EA – 62.39%; ERB – 61.13%; ES – 41.64%). Summary is captured in Table 4.40.

Table 4.40

Mean Components and Overall EL Scores Summarised by Gender

GENDER (M/F)		EK (25%)	EA (25%)	ERB (25%)	ES (25%)	EL TOTAL (WEIGHTED %)
Male	*Mean*	77.45	62.39	61.13	41.64	59.92
	N	291	289	287	279	291
	SD	20.82	10.32	12.07	23.09	11.77
	Min	5.88	24.00	28.29	.00	1.47
	Max	99.96	89.60	94.85	99.99	88.82
Female	*Mean*	76.62	65.70	65.99	49.36	63.42
	N	323	321	319	305	323
	SD	19.00	10.63	13.71	24.22	12.12
	Min	17.64	30.40	26.62	.00	11.76
	Max	99.96	91.20	93.18	99.99	91.77
Total	*Mean*	77.01	64.13	63.69	45.67	61.76
	N	614	610	606	584	614
	SD	19.88	10.61	13.17	23.98	12.08
	Min	5.88	24.00	26.62	.00	1.47
	Max	99.96	91.20	94.85	99.99	91.77

Levels of EL

Students' scores from the MSELS were converted into levels in other to have a comparable platform to the grading scheme used by the Ontario Ministry of Education. Scores were categorised into levels using the groupings in Table 4.41.

Table 4.41

Ontario Ministry of Education Grading Scheme for Achievement Levels

LEVELS	RANGE	INTERPRETATION
Level 1	50 – 59%	Below provincial standard
Level 2	60 – 69%	Approaching provincial standard
Level 3	70 – 79%	Provincial standard
Level 4	> 80%	Above provincial standard

Ontario Ministry of Education, 2010.

EL levels summarised by participating schools. First, frequency distribution for all schools was analysed for the overall EL scores. There were 13.4% of students below level 1, 21.7% in level 1; 35.5% in level 2; 25% in level 3; and 4.3% in level 4. See Table 4.42 for a summary of the frequency distribution of students' level of EL.

Table 4.42

Frequency Distribution of Students' Level of EL for All Participating Schools

		Frequency	*Valid Percent*	*Cumulative Percent*
Valid	Below level 1	78	13.4	13.4
	Level 1	126	21.7	35.2
	Level 2	206	35.5	70.7
	Level 3	145	25.0	95.7
	Level 4	25	4.3	100.0
	Total	580	100.0	
Missing System		45		
Total		625		

The frequency and the percentage distribution of students' scores from each participating school across levels 1-4 are displayed in Table 4.43.

Table 4.43

Level of EL Summarised by Participating Schools

			LEVEL OF EL (1-4)					
			<1	*1.0*	*2.0*	*3.0*	*4.0*	**Total**
SCHOOL ID	1.0	Count	3	5	22	21	3	54
		%	5.6%	9.3%	40.7%	38.9%	5.6%	100.0%
	2.0	Count	8	11	7	8	2	36
		%	22.2%	30.6%	19.4%	22.2%	5.6%	100.0%
	3.0	Count	18	17	15	11	0	61
		%	29.5%	27.9%	24.6%	18.0%	0.0%	100.0%
	4.0	Count	9	16	26	12	1	64
		%	14.1%	25.0%	40.6%	18.8%	1.6%	100.0%
	5.0	Count	4	3	20	15	4	46
		%	8.7%	6.5%	43.5%	32.6%	8.7%	100.0%
	6.0	Count	4	15	29	17	4	69
		%	5.8%	21.7%	42.0%	24.6%	5.8%	100.0%
	7.0	Count	1	3	10	11	1	26
		%	3.8%	11.5%	38.5%	42.3%	3.8%	100.0%
	8.0	Count	8	13	28	17	5	71
		%	11.3%	18.3%	39.4%	23.9%	7.0%	100.0%
	9.0	Count	10	19	28	16	2	75
		%	13.3%	25.3%	37.3%	21.3%	2.7%	100.0%
	10.0	Count	5	17	14	10	2	48
		%	10.4%	35.4%	29.2%	20.8%	4.2%	100.0%
	Eco-Club	Count	0	0	3	7	1	11
		%	0.0%	0.0%	27.3%	63.6%	9.1%	100.0%
	Teen Org	Count	8	7	4	0	0	19
		%	42.1%	36.8%	21.1%	0.0%	0.0%	100.0%
Total		Count	78	126	206	145	25	580
		%	13.4%	21.7%	35.5%	25.0%	4.3%	100.0%

EL levels summarised by students' grade level. The frequency and percentage of each grade across levels are displayed in Table 4.44. Grade 11 students had the largest

chunk of students at level 4 at 6.8%. See Table 4.44 for a full summary of EL levels across grades.

Table 4.44

Levels of EL Summarised by Grades

			LEVEL OF EL (1-4)					
			<1	***1.0***	***2.0***	***3.0***	***4.0***	**Total**
GRADE	7/8	Count	2	2	0	0	0	4
		%	50.0%	50.0%	0.0%	0.0%	0.0%	100.0%
	9	Count	9	9	3	0	0	21
		%	42.9%	42.9%	14.3%	0.0%	0.0%	100.0%
	10	Count	27	45	92	56	7	227
		%	11.9%	19.8%	40.5%	24.7%	3.1%	100.0%
	11	Count	16	38	43	39	10	146
		%	11.0%	26.0%	29.5%	26.7%	6.8%	100.0%
	12	Count	23	32	67	49	8	179
		%	12.8%	17.9%	37.4%	27.4%	4.5%	100.0%
	13	Count	0	0	1	1	0	2
		%	0.0%	0.0%	50.0%	50.0%	0.0%	100.0%
Total		Count	77	126	206	145	25	579
		%	13.3%	21.8%	35.6%	25.0%	4.3%	100.0%

EL levels summarised by city and county schools. EL levels were grouped based on schools location - city schools and county schools. The full results of the frequency analysis and tabulation are displayed in Table 4.45.

Table 4.45

Levels of EL Summarised by Schools' Location

			LEVEL OF EL (1-4)					
			<1	***1.0***	***2.0***	***3.0***	***4.0***	**Total**
SCHOOL LOCATION	City	Count	41	60	72	51	5	229
		%	17.9%	26.2%	31.4%	22.3%	2.2%	100.0%
	County	Count	37	66	134	94	20	351
		%	10.5%	18.8%	38.2%	26.8%	5.7%	100.0%
Total		Count	78	126	206	145	25	580
		%	13.4%	21.7%	35.5%	25.0%	4.3%	100.0%

EL levels summarised by EcoSchools and non-EcoSchools. Total EL scores were grouped based on EcoSchools and non-EcoSchools. The full results of the frequency analysis and tabulation are displayed in Table 4.46.

Table 4.46

Levels of EL Summarised by Schools' EcoSchools Status

			LEVEL OF EL (1-4)					
			<1	***1.0***	***2.0***	***3.0***	***4.0***	**Total**
ECOSCHOOL STATUS	EcoSchools	Count	53	93	168	121	21	456
		%	11.6%	20.4%	36.8%	26.5%	4.6%	100.0%
	Non-EcoSchools	Count	25	33	38	24	4	124
		%	20.2%	26.6%	30.6%	19.4%	3.2%	100.0%
Total		Count	78	126	206	145	25	580
		%	13.4%	21.7%	35.5%	25.0%	4.3%	100.0%

EL levels summarised by schools' level certification. The table displays the distribution of the students in various schools with different levels of certification and their performance across levels. The full results and frequency analysis and tabulation are displayed in Table 4.47.

Table 4.47

Levels of EL Summarised by Schools' Levels of Certifications

			LEVEL OF EL (1-4)					
			<1	***1.0***	***2.0***	***3.0***	***4.0***	**Total**
LEVEL OF CERFICATION	Non-EcoSchools	Count	25	33	38	24	4	124
		%	20.2%	26.6%	30.6%	19.4%	3.2%	100.0%
	Gold	Count	31	37	62	40	5	175
		%	17.7%	21.1%	35.4%	22.9%	2.9%	100.0%
	Silver	Count	22	56	106	81	16	281
		%	7.8%	19.9%	37.7%	28.8%	5.7%	100.0%
Total		Count	78	126	206	145	25	580
		%	13.4%	21.7%	35.5%	25.0%	4.3%	100.0%

EL Scores – Roth's Classification

Students' scores from the MSELS were converted into Roth's classification of EL (with Excel) using the classification from Table 4.48. Like the other previous dependent variables analysed, Roth's EL classification was also summarised using the same previous five independent variables: participating schools, students' grade level, location, EcoSchools status, and schools EcoSchools' level of certification.

Students' EL scores were summarised using Roth's EL continuum in the statistical analysis. Frequency tables were generated and displayed in the preceding sub-section.

Table 4.48

Roth's EL Continuum Classification Criteria (Recapped from chapter 3)

CRITERIA	CONTINUUM OF LITERACY
Scores below level 1 range (<50%)	Approaching nominal literacy - ANL (1)
Scores within the level 1 range (50 -59%)	Nominally literate – NL (2)
Scores within the level 2 range (60 – 69%)	Approaching functional literacy – AFL (3)
Scores within the level 3 range (70 – 74%)	Functionally literate - FL (4)
Scores within the upper level 3 range (75 – 79%)	Approaching operational literacy - AOL (5)
Scores within the level 4 range (≥ 80%)	Operationally literate – OL (6)

Roth's classification summarised by schools. From the frequency analysis Table 4.49, 16.4% of all the students surveyed were within Roth's level 1 continuum; 19.4% in level 2; 34.7% in level 3; 13.7% in level 4; 10.4% in level 5; and 3.9% were in level 6.

Table 4.49

Frequency Distribution of EL Scores -Roth's Classification for All Participating Schools

		Freq.	*%*	*Valid %*	*Cum %*
ROTH'S LITERACY LEVEL	Approaching Nominal Literacy - 1 (ANL)	96	15.3	16.4	16.4
	Nominally Literate – 2 (NL)	122	19.4	20.9	37.3
	Approaching Functional Literacy – 3 (AFL)	203	32.3	34.7	72.0
	Functionally Literate – 4 (FL)	80	12.7	13.7	85.6
	Approaching Operational Literacy - 5 (AOL)	61	9.7	10.4	96.1
	Operationally Literate – 6 (OL)	23	3.7	3.9	100.0
	Total	585	93.0	100.0	
Missing	System	44	7.0		
Total		629	100.0		

Further, schools were summarised by participating schools and the frequency and the percentage distribution of students' scores are displayed in Table 4.50.

Table 4.50

Frequency Distribution of EL Scores -Roth's Classification for Individual Participating Schools

			ROTH'S CONTINUUMS OF EL (1-6)						
			1	***2***	***3***	***4***	***5***	***6***	**Total**
SCHOOLS ID	1.0	Count	3	6	20	18	4	3	54
		%	3.1%	4.9%	9.9%	22.5%	6.6%	13.0%	9.2%
	2.0	Count	11	7	8	4	3	2	35
		%	11.5%	5.7%	3.9%	5.0%	4.9%	8.7%	6.0%
	3.0	Count	19	15	13	6	5	0	58
		%	19.8%	12.3%	6.4%	7.5%	8.2%	0.0%	9.9%
	4.0	Count	8	16	25	9	2	1	61
		%	8.3%	13.1%	12.3%	11.3%	3.3%	4.3%	10.4%
	5.0	Count	4	5	18	4	11	4	46
		%	4.2%	4.1%	8.9%	5.0%	18.0%	17.4%	7.9%
	6.0	Count	5	13	31	8	8	4	69
		%	5.2%	10.7%	15.3%	10.0%	13.1%	17.4%	11.8%
	7.0	Count	1	3	10	5	6	1	26
		%	1.0%	2.5%	4.9%	6.3%	9.8%	4.3%	4.4%
	8.0	Count	10	13	27	12	5	4	71
		%	10.4%	10.7%	13.3%	15.0%	8.2%	17.4%	12.1%
	9.0	Count	11	21	28	6	7	2	75
		%	11.5%	17.2%	13.8%	7.5%	11.5%	8.7%	12.8%
	10.0	Count	11	18	15	5	6	1	56
		%	11.5%	14.8%	7.4%	6.3%	9.8%	4.3%	9.6%
	Eco-Club	Count	0	1	4	3	4	1	13
		%	0.0%	0.8%	2.0%	3.8%	6.6%	4.3%	2.2%
	Teen Org	Count	13	4	4	0	0	0	21
		%	13.5%	3.3%	2.0%	0.0%	0.0%	0.0%	3.6%
Total		Total	Count	96	122	203	80	61	23
			%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Roth's classification summarised by students' grade level. Roth's EL classification by students' grade levels are summarised in Table 4.51. Majority of the grades 7/8 students fell within Roth level 1 and 2 continuums.

Table 4.51

Frequency Distribution of EL Scores -Roth's Classification for All Grade Levels

			ROTH'S CONTINUUMS OF EL (1-6)						Total
			1	*2*	*3*	*4*	*5*	*6*	
GRADES	7/8	Count	3	1	0	0	0	0	4
		%	3.2%	0.8%	0.0%	0.0%	0.0%	0.0%	0.7%
	9	Count	12	7	3	0	0	0	22
		%	12.6%	5.7%	1.5%	0.0%	0.0%	0.0%	3.8%
	10	Count	30	44	92	30	20	6	222
		%	31.6%	36.1%	45.3%	37.5%	32.8%	26.1%	38.0%
	11	Count	22	39	46	20	20	9	156
		%	23.2%	32.0%	22.7%	25.0%	32.8%	39.1%	26.7%
	12	Count	28	31	61	29	21	8	178
		%	29.5%	25.4%	30.0%	36.3%	34.4%	34.8%	30.5%
	13	Count	0	0	1	1	0	0	2
		%	0.0%	0.0%	0.5%	1.3%	0.0%	0.0%	0.3%
Total		Count	95	122	203	80	61	23	584
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Roth's classification summarised by city and county schools. Students' EL scores were summarised by categorising schools under city and county schools and cross tabulated with Roth's EL continuum. The summary of the frequency analysis and tabulation are displayed in Table 4.52.

Table 4.52

Frequency Distribution of EL Scores -Roth's Classification for County and City Schools

			ROTH'S CONTINUUMS OF EL (1-6)						Total
			1	*2*	*3*	*4*	*5*	*6*	
SCHOOL'S LOCATION	City	Count	52	57	71	28	23	4	235
		%	54.2%	46.7%	35.0%	35.0%	37.7%	17.4%	40.2%
	County	Count	44	65	132	52	38	19	350
		%	45.8%	53.3%	65.0%	65.0%	62.3%	82.6%	59.8%
Total		Count	96	122	203	80	61	23	585
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Roth's classification summarised by EcoSchools and non-EcoSchools. Students' EL scores were summarised by categorising schools under EcoSchools and non-EcoSchools cross tabulated with Roth's EL continuum. The full results of the frequency analysis and tabulation are displayed in Table 4.53. From the EcoSchools,

64.3% of the students fell into Roth's level 3 or above while for the non-EcoSchools, only 50.9% were on Roth's level 3 or above in the EL score.

Table 4.53

Frequency Distribution of EL Scores -Roth's Classification for EcoSchools and Non-EcoSchools

			ROTH'S CONTINUUMS OF EL (1-6)						
			1	***2***	***3***	***4***	***5***	***6***	**Total**
ECOSCHOOL STATUS	EcoSchools	Count	64	92	164	70	51	19	460
		%	66.7%	75.4%	80.8%	87.5%	83.6%	82.6%	78.6%
	Non-EcoSchools	Count	32	30	39	10	10	4	125
		%	33.3%	24.6%	19.2%	12.5%	16.4%	17.4%	21.4%
Total		Count	96	122	203	80	61	23	585
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Roth's classification summarised by schools level certification. Table 4.54 displays the frequency and percentage distribution of the students EL scores in various schools with gold, silver and no level of certification using Roth's criteria.

Table 4.54

Frequency Distribution of EL Scores -Roth's Classification for Non-EcoSchools, Gold and Silver Certified Schools

			ROTH'S CONTINUUMS OF EL (1-6)						
			1	***2***	***3***	***4***	***5***	***6***	**Total**
LEVEL OF CERFICATION	Non EcoSchools	Count	32	30	39	10	10	4	125
		%	33.3%	24.6%	19.2%	12.5%	16.4%	17.4%	21.4%
	Gold	Count	31	37	57	19	20	5	169
		%	32.3%	30.3%	28.1%	23.8%	32.8%	21.7%	28.9%
	Silver	Count	33	55	107	51	31	14	291
		%	34.4%	45.1%	52.7%	63.7%	50.8%	60.9%	49.7%
Total		Count	96	122	203	80	61	23	585
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

CHAPTER 5

INFERENTIAL DATA ANALYSIS

In this chapter, hypotheses are tested using inferential and descriptive statistics. As a recap, all hypotheses are re-stated. Subsequently, hypotheses are re-stated again in their own sub-sections, decision rules are specified and applicable test statistics performed. Finally, a decision is taken on whether to accept or reject the null hypothesis based on the decision rule. Eight hypotheses were tested and the results are analyzed and presented in this chapter.

Hypothesis 1—Majority of the Students Surveyed (≥51%) Will Not Score at a Level 3 or Higher in the EL Assessment

EL raw scores were converted into levels and a cumulative frequency table was created using SPSS 22. The cumulative percentage under each level was determined in order to reject or accept this hypothesis.

Decision rule. If the percentage of students scoring lower than a level 3 in their EL assessment is ≥ 51%, then accept the null hypothesis. Otherwise, reject the null hypothesis.

Test statistics and result. Table 5.1 below displays the frequency distribution of students' levels of EL for all participants. From the cumulative percentage column, 70.7% of the students surveyed in this board scored at a level 2 or lower in the EL assessment.

Table 5.1

Frequency Distribution of Students' Level of EL for All Participating Schools (Recalled from Chapter 3).

		Frequency	*Valid Percent*	*Cumulative Percent*
Valid	Below level 1	78	13.4	13.4
	Level 1	126	21.7	35.2
	Level 2	206	35.5	70.7
	Level 3	145	25.0	95.7
	Level 4	25	4.3	100.0
	Total	580	100.0	
Missing System		45		
Total		625		

Decision. The cumulative percent column showed that 70.7% of the students scored a level 2 or lower in their EL assessment. This number is ≥ 51% therefore the null hypothesis stating that majority of the students surveyed (51%) will not score at a level 3 or higher in the EL assessment is accepted.

Hypothesis 2—There is No Significant Difference in EL Scores of Students in EcoSchools and Non-EcoSchools

A two-tailed independent sample t-test was performed to test hypothesis 2.

Decision rule. If the significant (2-tailed) value is greater than 0.05, conclude that there is no statistically significant difference between the scores of students EL test in EcoSchools and non-EcoSchools. It means that the difference between condition means are likely due to chance and not because the schools are part of the EcoSchools program.

If the significance(2-tailed) value is less than 0.05, conclude that there is a statistically significant difference between the EL scores of students in EcoSchools and non-EcoSchools. It means that the difference between condition means are not likely due to chance and may be as a result of schools being part of the EcoSchools program.

Test statistics and result. For this hypothesis, an independent sample t-test was performed on students EL scores group by EcoSchools and non-EcoSchools. The groups

test descriptive statistics result is displayed in Table 5.2. This table provides the means and standard deviations of the groups. The t-test result is displayed in Table 5.3.

Table 5.2

EcoSchools and Non-EcoSchools Group Descriptive Statistics

EcoSchool status	*N*	*Mean*	*Std. Deviation*	*Std. Error Mean*
EcoSchools	456	63.56	10.92	0.51
Non-EcoSchools	125	59.64	11.44	1.02

From the test statistics in Table 5.3, the Levene's test for equality of variance is 0.150. This value is greater than 0.05 (indicating that the variability of the two sets of data (EcoSchools and non-EcoSchools EL scores) is about the same (not significantly different). Therefore, equal variance is assumed, and the first row (equal variance assumed) of the independence sample t-test is read (see Table 5.3).

Table 5.3

Independent Samples t-Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval	
	F	*Sig.*	*t*	*df*	*Sig. (2-tailed)*	*Mean Diff*	*Std. Error Diff*	Lower	Upper
Equal variances assumed	2.081	.150	3.516	579	.000	3.915	1.114	1.728	6.103
Equal variances not assumed			3.422	190.326	.001	3.915	1.144	1.658	6.172

Decision. The significant (2-tailed) result in Table 5.3 is $p < .000$. This result is less than 0.05, therefore, I can conclude that that there is a statistically significant difference between the EL scores of students in EcoSchools and non-EcoSchools.

Consequently, I reject the null hypothesis that there is no significant difference in EL scores of students in EcoSchools and non- EcoSchools. From this, I can infer that the

EL scores of the students in EcoSchools were relatively higher than the scores of students in non-EcoSchools and the observation was not by chance.

Hypothesis 3—There is No Significant Difference in EL Scores of Students in Gold Certified Schools, Silver Certified Schools and Non-EcoSchools (Schools with No EcoSchools' Certification)

A one-way ANOVA was conducted. Tukey HSD was used to determine the exact groups where the difference existed.

Decision rule. If the significance value (labeled *p)* is less than alpha, reject H_0; if it's greater than alpha, do not reject H_0.

Test statistics and result. To test this hypothesis, an ANOVA was performed on the data (EL scores of students grouped by schools' level of certification). Table 5.4 shows the means and standard deviations of the groups analysed.

Table 5.4

Descriptive Statistics of Non-EcoSchools, Gold and Silver Certified Schools.

LEVELS OF CERTIFICATION	*N*	*Mean*	*SD*	*Std. Error*	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
Non-EcoSchools	125	59.64	11.44	1.02	57.61	61.67	38.70	83.44
Gold	175	61.36	11.69	.88	59.62	63.11	26.59	88.82
Silver	281	64.92	10.19	.61	63.72	66.12	39.16	91.77
Total	581	62.71	11.14	.46	61.81	63.62	26.59	91.77

From Table 5.5, there was a statistically significant difference at $p < .000$ level in EL scores for non-EcoSchools, gold certified and silver certified EcoSchools F (2, 578) = 11.99, $p < 0.00$.

Table 5.5

ANOVA Table Non-EcoSchools, Gold and Silver Certified Schools.

	Sum of Squares	*df*	*Mean Square*	*F*	*Sig.*
Between Groups	2866.43	2	1433.22	11.99	.00
Within Groups	69093.33	578	119.54		
Total	71959.77	580			

Therefore, to determine which groups were significantly different from the other, the Post Hoc test (in this case Tukey) was done. The result of the Post Hoc test is displayed in Table 5.6.

Post Hoc test table. Post-hoc comparisons using the Tukey HSD test indicated that the mean EL score for gold certified schools (M = 61.36, SD = 11.69) was significantly different from silver certified schools (M = 64.92, SD = 10.19) and non-EcoSchools (M = 59.64, SD = 11.44) was significantly different from silver certified schools. There was no statistically significant difference in mean scores between gold certified schools and non-EcoSchools (see Table 5.6).

Table 5.6

Multiple Comparisons Post Hoc Values for Non-EcoSchools, Gold and Silver Certified Schools - Tukey HSD

(I) EcoSchool Level of Certification	(J) EcoSchool Level of Certification	*Mean Difference (I-J)*	*Std. Error*	*Sig.*	95% Confidence Interval	
					Lower Bound	Upper Bound
Non-EcoSchools	Gold	-1.72	1.28	.37	-4.73	1.28
	Silver	-5.28*	1.18	.00	-8.04	-2.52
Gold	Non-EcoSchools	1.72	1.28	.37	-1.28	4.73
	Silver	-3.55*	1.05	.00	-6.03	-1.08
Silver	Non-EcoSchools	5.28*	1.18	.00	2.52	8.04
	Gold	3.55*	1.05	.00	1.08	6.03

*. The mean difference is significant at the 0.05 level.

Decision. In this instance, the significance value is 0.00 and this is less than alpha < .05, I reject the null hypothesis. In other words, there was a significant difference between the groups, F (2, 578) = 11.99, $p < 0.00$.

Hypothesis 4—There is no Significant Difference in EL Scores of Students in County Schools and Those in City Schools

In order to test for a significant difference in the EL scores of students in city schools and students in county schools, an independent-samples t-test was conducted.

Decision rule. If the sig (2-tailed) value is greater than 0.05, I can conclude that there is no statistically significant t difference between the scores of students EL test in EcoSchools and non-EcoSchools; which means that the difference between condition Means are likely due to chance and not due to the location of the schools.

If the sig (2-tailed) value is less than 0.05, I conclude that there is a statistically significant difference between the EL scores of students in EcoSchools and non-EcoSchools. This means that the difference between condition Means are not likely due to chance and may be as a result of schools' location.

Test statistics and result. From the test statistics in Table 5.7, Levene test for equality of variance was 0.70. This value is greater than 0.05 (indicating that the variability of the two sets of data—city and county schools EL scores—is about the same (not significantly different). Therefore, equal variance is assumed, and the first row (equal variance assumed) of the independence sample t-test table's values is read.

Table 5. 7

Independent Samples Test for City and County Schools.

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	*Sig.*	*t*	*df*	*Sig. (2-tailed)*	*Mean Diff*	*Std. Error Diff*	Lower	Upper
Equal variances assumed	1.615	.204	-3.69	579	.00	-3.45	.94	-5.29	-1.61
Equal variances not assumed			-3.63	462.27	.00	-3.45	.95	-5.31	-1.58

The descriptive statistics for each group (county and city schools) is displayed in Table 5.8.

Table 5.8

City and County Schools Descriptive Statistics.

SCHOOL LOCATION	*N*	*Mean*	*Std. Deviation*	*Std. Error Mean*
City	229	60.62	11.49	.76
County	352	64.07	10.70	.57

Decision. The significant (2-tailed) result in Table 5.7 is $p < 0.00025$. This result is less than 0.05, therefore, I can conclude that that there is a statistically significant difference between the EL scores of students in city and county schools. Hence, I reject the null hypothesis that there is no significant difference in EL scores of students in city and county schools. This result implies that the EL scores of students in city schools were lower on the average than their counterpart in county schools.

Hypothesis 5—There is no Significant Difference in EL Scores of Students in Different Grade Levels

In order to test for a significant difference in the EL scores of students in grades 7 to 13, a one-way between groups ANOVA was also conducted to analyse the influence of

grade level of students on EL scores. Students were divided into six groups according to their grade levels.

Decision rule. If the significance value (labeled *p)* is less than alpha (0.05), reject H_0; if it's greater than alpha, do not reject H_0.

Test statistics and result. A one-way ANOVA test was performed on students EL scores grouped by their grade level to determine whether there was a difference in mean scores between groups. From Table 5.9, there was a statistically significant difference at the $p < 0.00$ level in EL scores for grade groups F (5, 574) = 8.67, $p < 0.00$.

Table 5.9

ANOVA for EL Scores for Grades

	Sum of Squares	*df*	*Mean Square*	*F*	*Sig.*
Between Groups	5006.54	5	1001.31	8.67	.000
Within Groups	66328.32	574	115.56		
Total	71334.86	579			

Therefore, in order to determine specifically which groups were different from each other, the Post Hoc test (in this case Tukey HSD) was done. The result of the Post Hoc test is displayed in Table 5.10. The descriptive statistics presenting the mean and standard deviation is displayed in Table 5.10.

Table 5.10

Descriptive Statistics for EL Scores by Grade Levels.

				Std.	95% Confidence Interval for Mean			
Grades	*N*	*Mean*	*S.D*	*Error*	Lower Bound	Upper Bound	*Min*	*Max*
7/8	4	49.13	4.45	2.22	42.05	56.21	43.48	54.04
9	21	49.23	10.33	2.25	44.52	53.93	26.59	63.94
10	227	62.72	10.34	.69	61.36	64.07	38.87	87.43
11	146	64.21	10.99	.91	62.41	66.01	38.70	91.77
12	180	63.47	11.18	.83	61.83	65.12	33.28	89.87
13	2	65.87	6.15	4.35	10.58	121.15	61.51	70.22
Total	580	62.76	11.10	.46	61.85	63.66	26.59	91.77

Post-hoc comparisons using the Tukey HSD Test indicated that the mean EL score for grades 7 & 8 (*M* = 49.13, *SD* = 4.45) was not significantly different from grades 9 to 13; grade 9 EL score (*M* = 49.23, *SD* = 10.33) was significantly different from the EL scores of grade 10 (*M* = 62.72, *SD* = 10.34), grade 11 (*M* = 64.21, *SD* = 10.99) and grade 12 (*M* = 63.47, *SD* = 11.18). There was no statistically significant difference in mean scores between grades 11 to 13 (see Table 5.11).

Decision. For this hypothesis, the significance value is 0.000 and this is less than alpha = .05, I reject the null hypothesis. There was a significant difference between the groups, F (5, 579) = 8.67, p <0.000.

Table 5.11

Multiple Comparisons Post Hoc (Tukey HSD) Statistics for EL of Students by Grades

		Mean			95% Confidence Interval	
(I) Grade	(J) Grade	*Difference (I-J)*	*Std. Error*	*Sig.*	Lower Bound	Upper Bound
7/ 8	9	-.10	5.86	1.000	-16.87	16.67
	10	-13.59	5.42	.124	-29.09	1.91
	11	-15.08	5.45	.064	-30.66	.50
	12	-14.35	5.43	.089	-29.89	1.19
	13	-16.74	9.31	.468	-43.36	9.88
9	7/8	.10	5.86	1.000	-16.67	16.87
	10	-13.49*	2.45	.000	-20.50	-6.48
	11	-14.98*	2.51	.000	-22.15	-7.81
	12	-14.25*	2.48	.000	-21.33	-7.16
	13	-16.64	7.95	.293	-39.38	6.11
10	7/8	13.59	5.42	.124	-1.91	29.09
	9	13.49*	2.45	.000	6.48	20.50
	11	-1.49	1.14	.781	-4.75	1.77
	12	-.76	1.07	.981	-3.82	2.31
	13	-3.15	7.63	.998	-24.98	18.68
11	7/ 8	15.08	5.45	.064	-.50	30.66
	9	14.98*	2.51	.000	7.81	22.15
	10	1.49	1.14	.781	-1.77	4.75
	12	.73	1.20	.990	-2.69	4.16
	13	-1.66	7.65	1.000	-23.54	20.23
12	7/ 8	14.35	5.43	.089	-1.19	29.89
	9	14.25*	2.48	.000	7.16	21.33
	10	.76	1.07	.981	-2.31	3.82
	11	-.73	1.20	.990	-4.16	2.69
	13	-2.39	7.64	1.000	-24.25	19.46
13	7/8	16.74	9.31	.468	-9.88	43.36
	9	16.64	7.95	.293	-6.11	39.38
	10	3.15	7.63	.998	-18.68	24.98
	11	1.66	7.65	1.000	-20.23	23.54
	12	2.39	7.64	1.000	-19.46	24.25

*Note: *. The mean difference is significant at the 0.05 level.*

Hypothesis 6—Majority of Students in EcoSchools (51% Or Higher) Are Not Significantly Aware (Level 3 Or Higher) of Their Schools as Part of The EcoSchools Program

Decision rule and assumption. I defined a significant level of awareness of the EcoSchools program as a score of level 3 or higher. If the percentage (9%) of students scoring < level 3 in EcoSchools awareness ≥ 51%, then accept the H_0.

Test statistics and result table. Using Table 5.12, the cumulative frequency table indicated that 67% of the students fall within awareness levels 2 or lower indicating that the remaining 33% fall within an awareness level of 3 or 4.

Table 5.12

Students' Awareness Level of EcoSchools Program in the Schools

	EcoSchools Awareness Level (0-4)					
	0.0	1.0	2.0	3.0	4.0	Total
Count	148	50	117	59	95	469
	31.6%	10.7%	24.9%	12.6%	20.3%	100.0%
Cumulative Frequency	31.6%	42.3%	67.2%	79.8%	100%	

Decision. The hypothesis, "the majority of students in EcoSchools (51% or higher) are not significantly aware of their schools as part of the EcoSchools program", is accepted.

Hypothesis 7—There Is No Significant Difference in Students' Level of Awareness of the EcoSchools Program for Schools with Different Levels of Certification. In Other Words, Students Level of Awareness is Not Related to Schools Certification Level

The Chi-Square (χ^2) test was used to test for a significance difference in students' level of awareness of the EcoSchools program in schools with gold and silver certifications.

Decision rule. If the computed χ^2 is greater than the theoretical (critical value) or expected χ^2 (i.e. $\chi_o^2 > \chi_c^2$), then reject the null hypothesis, and if the observed χ^2 is less than the theoretical χ^2 accept the null hypothesis. In other words, if p value < 0.05, then reject the null hypothesis, otherwise, accept it.

Test statistics and result table. A Pearson Chi-Square test was conducted on the data set (see Table 5.14). The χ^2 was computed (see Table 5.13) using a total of 469 cases

for the test. From the first row, Pearson Chi-Square statistics was, $\chi^2 = 19.677$, and $p < 0.001$. The contingency table used for the χ^2 computation is displayed in Table 5.14.

Table 5.13

Chi Squared—χ^2 Contingency Table for EcoSchools Level of Certification Versus EcoSchools Awareness Level (0-4)

			EcoSchools Awareness Levels (0-4)					
			0.0	1.0	2.0	3.0	4.0	Total
EcoSchool Level of Certification	Gold	Count	43	17	38	17	52	167
		Expected Count	52.7	17.8	41.7	21.0	33.8	167.0
		% within EcoSchool Level of certification	25.7%	10.2%	22.8%	10.2%	31.1%	100%
	Silver	Count	105	33	79	42	43	302
		Expected Count	95.3	32.2	75.3	38.0	61.2	302.0
		% within EcoSchool Level of certification	34.8%	10.9%	26.2%	13.9%	14.2%	100%
Total		Count	148	50	117	59	95	469
		Expected Count	148.0	50.0	117.0	59.0	95.0	469.0
		% within EcoSchool Level of certification	31.6%	10.7%	24.9%	12.6%	20.3%	100%

Decision. From the χ^2 table, computed χ^2 (19.677) > χ_c^2 (9.488). In other words, *p* value (0.001) < 0.05, therefore, the H_0, there is no significant difference in students' level of awareness of the EcoSchools program for schools with different levels of certification (in other words, hypothesis stating that students' level of awareness is not related to schools certification level) is rejected.

Table 5.14

Chi Squared—χ^2 Tests for EcoSchools Level of Certification and Awareness Level.

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	19.677[a]	4	.001
Likelihood Ratio	19.055	4	.001
Linear-by-Linear Association	11.323	1	.001
N of Valid Cases	469		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 17.80.

Further test for hypothesis 7. Since hypothesis 7 suggested that students' level of awareness was related to schools EcoSchools certification, a correlation was done between students' awareness scores and EcoSchools level of certification. This determined whether there was a relationship between these two variables. Correlation test result suggested that students' awareness level had a weak positive correlation with EcoSchools level of certification (r = .167, n = 471, p < 0.0005). See Table 5.15 for test statistics.

Table 5.15

Correlation Statistics for EcoSchools Awareness and EcoSchools Levels of Certification.

		EcoSchools Awareness (%)	ECOSCH LEVEL OF CERFICATION
EcoSchools Awareness (%)	Pearson Correlation	1	.166**
	Sig. (1-tailed)		.000
	N	471	471
ECOSCH LEVEL OF CERFICATION	Pearson Correlation	.166**	1
	Sig. (1-tailed)	.000	
	N	471	488

**. Correlation is significant at the 0.01 level (1-tailed).

Hypothesis 8—Students Main Source of Environmental Knowledge is Not the EcoSchools Program

Students were asked to rate (on a scale of 1-5), the extent to which television, school subjects, EcoSchools club, books, web/internet, other environmental clubs, friends and other sources contributed to their environmental knowledge. Responses were tallied and objective weighted ranking method was used to rank the various sources of students' environmental knowledge.

Decision rule. If the factor ranked #1 ≠ EcoSchools program, then accept null hypothesis in other words, if the number one ranked factor is not the EcoSchools program, then accept the null hypothesis.

Test statistics and result. Using Table 5.16, weights were assigned to the frequency in each category and added up; and the ranking of each factor was determined. The weighted ranking results indicated that school subjects ranked as number 1 source of students environmental knowledge, web/internet ranked 2nd, television was 3rd, books was 4th, friends, EcoSchools Club, other environmental club, and other sources ranked 5th, 6th, 7th and 8th respectively.

Table 5.16

Weighted Ranking of Source of Environmental Knowledge

	No Extent (0)	Some Extent (1)	Moderate Extent (2)	Large Extent (3)	Great Extent (4)	TOTAL	RANK
Television	73 x 0	132 x 1	204 x 2	126 x 3	73 x 4		
(Weight)	(0)	(132)	(408)	(378)	(292)	1210	3rd
School Subjects	24 x 0	58 x 1	169 x 2	209 x 3	146 x 4		
(Weight)	(0)	(58)	(338)	(627)	(584)	1607	1st
EcoSchools Club	407 x 0	85 x 1	57 x 2	31 x 3	25 x 4		
(Weight)	(0)	(85)	(104)	(93)	(100)	383	6th
Books	148 x 0	181 x 1	158 x 2	84 x 3	34 x 4		
(Weight)	(0)	(181)	(316)	(252)	(136)	885	4th
Web/Internet	41 x 0	94 x 1	150 x 2	179 x 3	141 x 4		
(Weight)	(0)	(94)	(300)	(537)	(564)	1495	2nd
Other Environmental Club	476 x 0	44 x 1	49 x 2	15 x 3	21 x 4		
(Weight)	(0)	(44)	(98)	(45)	(84)	271	7th
Friends	199 x 0	201 x 1	128 x 2	48 x 3	28 x 4		
(Weight)	0)	(201)	(256)	(144)	(112)	713	5th
Other Sources	503 x 0	31 x 1	34 x 2	17 x 3	19 x 4		
(Weight)	(0)	(31)	(68)	(51)	(76)	226	8th

Decision. From the weighted ranking result, the main source of environmental knowledge for students is not the EcoSchools, therefore, the null hypothesis, students main source of environmental knowledge is not the EcoSchools program is accepted. This

implied that another source of knowledge (i.e., schools subjects), is ranked first as the main source of environmental knowledge for students in this survey.

Summary of Hypotheses Testing

In this section, nine hypotheses were tested. Using various test statistics both inferential and descriptive. The summary of test performed and the decisions taken is summarised in Table 5.18 – test of hypotheses summary table.

Table 5.17

Test of Hypotheses Summary Table

S/N	Hypothesis	Statistical Test Performed	Result	Decisions
1	Majority of the students' surveyed (≥51%) will not score at a level 3 or higher in the EL assessment.	Cumulative frequency distribution table	Level 3 (or ↑) = 29.3% ≠ or >51%	Accepted H_0
2	There is no significant difference in the EL scores of students in EcoSchools and non- EcoSchools.	Independent sample t-test	$p<0.000<0.05$	Rejected H_0
3	There is no significant difference in the EL scores of students in gold certified schools, silver certified schools and non-EcoSchools (schools with no EcoSchools' certification).	ANOVA	$F(2, 578) = 11.99$, $p<0.00<0.05$	Rejected H_0
4	There is no significant difference in the EL scores of students in county schools and those in city schools.	Independent sample t-test	$p<0.00025< 0.05$	Rejected H_0
5	There is no significant difference in the EL scores of students in different grade levels.	ANOVA	(5, 574) = 8.67, $p<0.00< 0.05$	Rejected H_0
6	Majority of students in EcoSchools (51% or higher) are not significantly aware (level 3 or higher) of their schools as part of the EcoSchools program.	Cumulative frequency distribution table	Level 3 (or ↑) = 33% ≠ or >51%	Accepted H_0
7	There is no significant difference in students' level of awareness of the EcoSchools program for schools with different levels of certification (in other words, students level of awareness is not related to schools certification level).	χ^2	$\chi^2 = 19.677$, and $p<0.00<0.05$	Rejected H_0
8	Students' main source of environmental knowledge is not the EcoSchools program.	Objective weighted ranking	School subject = ranked 1st	Accepted H_0

Replies to Research Questions

This section summarised the answer to the following research questions.

Research question 1—what is the EL level of students in the surveyed school board (using Roth's EL continuum and Ontario grading levels)? The average EL level of students surveyed in this board was 62.76% (level 2 – approaching provincial standard). The majority of the students (70.7%) were at a level 2 or lower while 29.3% of the students score at a level 3 (provincial standard) or higher (see Table 5.1 for the distribution of the students EL levels).

On Roth's continuum, 16.9% of the students were approaching nominal literacy, 41.8% were nominally literate, 34.2% were approaching functional literacy, 5.6% were functionally literate, and 1% was approaching operation literacy while 0.5% of the students were operationally literate.

Research question 2— do students in schools with EcoSchools program demonstrate a higher level of EL compared to students in schools without EcoSchools program? Yes, students in EcoSchools demonstrated a higher level of EL (level 2 - 63.56% average score) than students in the non-EcoSchools (level 1- 59.64% average score).

Research question 3— do students in schools (with gold, silver or no level of EcoSchools certification) display different levels of EL? Yes, students in schools with various EcoSchools or no EcoSchools certification displayed different levels of EL. Students in gold and silver schools displayed the same level of EL (level 2). Although statistically, the scores were significantly different with the silver schools scoring on the average 64.92% to the gold schools 61.36%.

On the other hand, the non-EcoSchools students scored on the average 59.64% (level 1). Although this score was lower than the average score posted by the gold schools, it was not statistically different from the average score posted by the gold schools.

Research question 4— do students in county schools and students in city schools display different levels of EL? On the average, students in city and county schools did not display different levels of EL. The city schools posted an average of 60.62% while the county schools posted an average of 64.07%. Although these two averages were on the same level of EL (level 2), statistically, the scores were significantly different.

Research question 5— do students' EL scores vary across grades (7 to 13)? Students EL scores varied across grades. Means ranged from 49.13% in grades 7/8 to 63.47% among the grade 12 students. From the grades 10 to 12, EL scores dis not vary a lot in range. The grades 10 had an average of 62.72%, while the grade 11 students scored 64.21% on average.

Research question 6— how aware of the EcoSchools program are students in the schools with the EcoSchools program? More than half (57.8%) of the students who participated in this research had an awareness level of fair to excellent which meant that they scored higher than 60% in the awareness rating. The other 42.2% of the students had a low to an extremely low level awareness rating of the EcoSchools program in their schools.

Research question 7— does students' level of awareness vary with the level of their school's EcoSchools' certification (gold, silver or no certification)? Test statistics showed that students' level of awareness varied with the schools EcoSchools

level of certification. In schools with gold certification, 64.1% of the students had a moderate to high level of awareness of the EcoSchools program while in the schools with silver certification, 54.3% of the students had a moderate to high level of awareness of the EcoSchools program.

Research question 8— how do students rank the EcoSchools program as a source of environmental knowledge for students? The result of the weighted ranking indicated that the EcoSchools program was not the main source of environmental knowledge for the students in this survey. Rather, the EcoSchools was ranked sixth as a source of environmental knowledge among student participants. The most important source of environmental knowledge for the students was the school subjects.

Research question 9—How do the EcoSchools teacher co-ordinators' perceive the EcoSchools program (what they do, what is great, and what needed to change)? Overall, the EcoSchools teacher co-ordinator s perceived the EcoSchools program as a very positive experience and a time addition for environmental need of the school community and as an avenue for presenting and promoting to the students and the school community environmental issues and awareness.

On the other hand, while some teachers agreed that the EcoSchools was unquestionably an excellent idea, they were skeptical about the strict requirements that a few of them considered not relevant to students interest.

For what needed to change, a few teachers would like a better conversation with the board and more human involvement, which is, reducing online activities and increasing human interactions. Other changes the teachers mentioned would be necessary in moving ahead were those related to infrastructural (updating old traditional utilities in school building), administrative (more support), teacher manpower requirement

(considering the EcoSchools as part of the coordinating teachers' teaching load), increasing students' involvement, changes in program composition and requirements (e.g., reducing the overwhelming amount of paperwork that must be completed for the certification process).

CHAPTER 6

ANALYSIS AND PRESENTATION OF QUALITATIVE DATA

Part I: School Walk-Around Analysis

In order to add richness and greater insights into the quantitative data, a school Walk-Around sheet (see Appendix B) was used for making observational notes on the visibility of the EcoSchools program and its' manifestations. The Walk-Around also served as triangulation for the EcoSchools Questionnaire.

Seven main themes guided the Walk-Around observation: school grounds greening, presence of an eco-board, quality of eco-board materials and aesthetics, EcoSchools awareness posters, EcoSchools recycle bins/labels, and visible cues encouraging good environmental practice around the school. These themes were observed and graded on a scale of 1 to 5 (l being the lowest—to indicate their availability and the shape they were in) if they were existing, and/or noted if any of the parameters were not existing (e.g., when a school has no Eco-board, it is recorded as non-existent).

The observation and summary is grouped according to participating schools. The physical characteristics of the schools and their locations are discussed in this section. Schools' EcoSchools status from school year 2013/14 was used.

Parameter 1: School Yard Greening

Green school yards included every greening, gardening, green house, potted plants, open space with trees and chairs (park nature) that represented an additional effort to improve school's aesthetics and provide green space, different from the original school's landscape. A green school yard was assessed as either existing or was non-existent. For the schools that had an active green school yard, the appearance and content of the yard was rated on a continuum scale of 1 -5. Scale 1 indicated that the yard needed a lot of

work and scale 5 indicated a very green school yard space, evidence of conscious deliberate greening efforts.

Parameter 2 and 3 - Eco-Boards (existing or not existing) and Eco-Boards materials

Eco-boards are notice boards that provide students with environmental information. Also, they may have visual or written cues and guidelines to encourage better practices. It may also display environmental themes around the following: eco-friendly models, scholarships for courses at the university, college or work place related, school, world and local news, innovations and practices, and/or interesting ongoing competitions for which students, teachers or schools can enter or participate.

In a school, there may or may not be an eco-board. Schools without eco-boards are marked as non-existing and schools with eco-boards have their eco-board material grade on a continuum scale of 1-5 taking into consideration the listed material content criteria. A scale of 1 indicated that material were few, outdated and not relevant to students need or the constantly changing world. A scale of 5 indicated that the material met most or all of the content criteria previously listed.

Parameter 4 - Eco-Boards' Aesthetics

The Eco-boards' aesthetics dealt with the appeal of the board, its' noticeability and visibility from afar, and its ability to catch the attention of school community. The aesthetics of the eco-board are graded on a scale of 1-5. A grade of 1 indicated that materials were very dull, not very noticeable, and visible or appealing to the eye. While a grade of 5 indicated that eco-board was very appealing with eye catching colours and displays that were visible from afar and very inviting to students to take a second look.

Parameter 5 - EcoSchools Awareness Posters

The EcoSchools program provides monthly 10X10 posters for displays in participating schools. In addition to these posters, there are other stickers, posters, activity and lesson suggestions available for use in schools.

This parameter covered the visibility of the posters from the EcoSchools' program around the schools and also the presence of the EcoSchools flag. The more visible the posters, the higher the rating assigned.

Schools that had an overarching availability and display of these posters all around the school were rated a 5 (instantly obvious within minutes of entering the school that school was one of the EcoSchools as a result of the sheer quantity of the EcoSchools material displayed around the school). While schools that did not project that instant feeling of being one of the EcoSchools was rated a level 1, that is, the EcoSchools program had minimal exposure and could really benefit from more exposure, posters were sparse of rarely present.

Parameter 6 - EcoSchools Recycle Bins/Labels

The EcoSchools program also provide a trio of metallic bins coloured red, blue and white for recycling paper, cans/containers and waste disposal. The availability of these cans and appropriate labels over them was the grading criteria. Schools with abundance and properly labelled recycling bins were rated a five, while schools that had no bins or had bins that were not properly labelled were rated from zero to four accordingly.

Parameter 7 - Visible cues encouraging good environmental practice

Finally, parameter 7 covered other posters other than the EcoSchools posters promoting good environmental behaviour around the school. It parameter also included

students' work and contribution towards good environmental practice, displayed in strategic corner and areas in the schools.

Other Observations

Observations were made to indicate the state of the parameters and any other note-worthy information that may add insights to the quantitative data. The contact teachers also answered any questions that needed clarification.

Results of School Walk-Around Observation Summarised by Schools

Ten schools were used for data collection. Walk-A-Around observations is summarised in the next sections.

School 1. School 1 is represented in the statistical analysis as Sch 1.0. School 1 was one of the EcoSchools with a silver level certification and located in a thriving manufacturing and agricultural county. School 1 has two EcoSchool teacher co-ordinators. The observations summary for each parameter is captured in Table 6.1.

Table 6.1

Parameters Summary for School (1.0) Walk-Around Observation

PARAMETERS	OBSERVATIONS	RATING
Parameter 1 School ground greening	There were several open spaces within the school (stair-ways, landing and hallways) had green potted plants in abundance. More than a two dozens of potted plants were observed and these plants really added to the aesthetics of the school. On the other hand, outside of the school building had no evidence of deliberate greening. A green house was observed, but it was not clear if it was for the use of the EcoSchools or for teaching purposes.	3
Parameter 2: Eco-boards	There was no eco-board observed in this school.	0
Parameter 3: Eco-boards materials.	There was not eco-board to rate its materials.	0
Parameter 4: Eco-board aesthetics.	There was no eco-board to rate its' aesthetics.	0
Parameter 5: EcoSchools awareness posters.	No EcoSchools awareness poster was observed.	0
Parameter 6: EcoSchools recycle bins/labels.	EcoSchools and recycle bins were very visible. There was an abundance of bins strategically located in trios around the school. But there were no labels on the bins telling students where to put the recycles or garbage.	3.5
Parameter 7: Visible cues encouraging good environmental practice.	There were a few lights out notices in the classroom, but no other obvious/visible cues encouraging good environmental behaviour were observed.	1

School 2. School 2 is represented in the statistical analysis as Sch 2.0. School 2 was not one of the EcoSchools. It is also located in a thriving agricultural county. Although school 2 was not one of the EcoSchools, it was on course to getting an eco-club established and becoming an EcoSchool within a month of the study. The observations summary for each parameter is captured in Table 6.2.

Table 6.2

Parameters Summary for School (2.0) Walk-Around Observation

PARAMETERS	OBSERVATIONS	RATING
Parameter 1: School ground greening	There was a courtyard dedicated to school yard greening activity. Although the space appears to be in its infancy, it was an obvious deliberate effort to provide a green space for the school community. There were green plants in school hallways too.	4
Parameter 2: Eco-boards	There was no eco-board observed in this school.	0
Parameter 3: Eco-boards materials.	Non-existing	0
Parameter 4: Eco-board aesthetics.	Non-existing	0
Parameter 5: EcoSchools awareness posters.	As expected, no EcoSchools awareness poster was observed since this school was not one of the EcoSchools.	0
Parameter 6: EcoSchools recycle bins/labels.	EcoSchools and recycle bins were very visible. There was an abundance of bins strategically located around the school although there were no labels on the bins telling students where to put the recycles or garbage.	3.5
Parameter 7: Visible cues encouraging good environmental practice.	There were a few obvious/visible cues encouraging good environmental behaviour and practice like lights out notices in classroom.	1

School 3. School 3 is represented in the statistical analysis as Sch 3.0. School 3 is an EcoSchools with a gold level certification. It is located in the inner city of a thriving urban area. School 3 had one EcoSchools teacher co-ordinator. The observations summary for each parameter is captured in Table 6.3.

Table 6.3

Parameters Summary for School (3.0) Walk-Around Observation

PARAMETERS	OBSERVATIONS	RATING
Parameter 1: School ground greening	No visible evidence of school yard greening was observed.	0
Parameter 2: Eco-boards	There was no eco-board observed in this school.	0
Parameter 3: Eco-boards materials.	Non-existing.	0
Parameter 4: Eco-board aesthetics.	Non-existing.	0
Parameter 5: EcoSchools awareness posters.	No EcoSchools' awareness posters were observed at the time of this study.	0
Parameter 6: EcoSchools recycle bins/labels.	EcoSchools and recycle bins were not very visible. There was a paucity of EcoSchools recycle bins. At the time of this study, no EcoSchools trio bins were observed.	0
Parameter 7: Visible cues encouraging good environmental practice.	There were no obvious/visible cues encouraging good environmental behaviour and practices.	1

Other observations. There was a common area that looked somewhat cleared and cleaned out with about a dozen plants, most of which were dried out. There was a stack of cobble stones that would make for excellent landscaping, some outdoor chairs, empty green house and three composting bins. Although this area existed, it was not the EcoSchools that maintained it and it was visibly in need of maintenance and care.

School 4. School 4 is represented in the statistical analysis as Sch 4.0. School 4 is an EcoSchools with a gold level certification. It is located in the inner city of a thriving urban area. School 4 had one EcoSchools' teacher co-ordinator. The observations summary for each parameter is captured in Table 6.4.

Table 6.4

Summary of Parameters for School (4.0) Walk-Around Observation

PARAMETERS	OBSERVATIONS	RATING
Parameter 1: School ground greening	No visible evidence of school yard greening was observed.	0
Parameter 2: Eco-boards	Not conspicuous[9] but existing in the cafeteria.	Existing
Parameter 3: Eco-boards materials.	Not existing.	0
Parameter 4: Eco-board aesthetics.	Not existing.	0
Parameter 5: EcoSchools awareness posters.	No EcoSchools' awareness posters were observed at the time of this study.	0
Parameter 6: EcoSchools recycle bins/labels.	EcoSchools and recycle bins were not very visible. There was a paucity of EcoSchools recycle bins. At the time of this study, no EcoSchools trio bins were observed.	0
Parameter 7: Visible cues encouraging good environmental practice.	There were no obvious/visible cues encouraging good environmental behaviour and practices.	1

School 5. School 5 is represented in the statistical analysis as Sch 5.0. School 5 is one of the EcoSchools with a gold level certification. It is located in the county (partly an agrarian community). School 5 had two EcoSchools teacher co-ordinators. The observations summary for each parameter is captured in Table 6.5.

Table 6.5

Summary of Parameters for School (5.0) Walk-Around Observation

PARAMETERS	OBSERVATIONS	RATING
Parameter 1 School ground greening	No visible evidence of school yard greening was observed.	0
Parameter 2 Eco-boards	There was an eco-board strategically located at school's entrance observed in this school.	Existing
Parameter 3 Eco-boards materials.	Some EcoSchools material encouraging recycling and greening.	2.5
Parameter 4 Eco-board aesthetics.	Has some materials, could be more eye catching.	2.5
Parameter 5 EcoSchools awareness posters.	No EcoSchools' awareness posters were observed at the time of this study.	1
Parameter 6 EcoSchools recycle bins/labels.	EcoSchools and recycle bins were very visible but not labelled.	4.5
Parameter 7 Visible cues encouraging good environmental practice.	There were no obvious/visible cues encouraging good environmental behaviour and practices, but there were light out signs in some classrooms.	1

[9] Eco-board was located in the cafeteria.

Other observations. There was an active composting program in the staff room and cafeteria. There was also a battery recycling program, but the location of this of the activity was not clarified.

School 6. School 6 is represented in the statistical analysis as Sch 6.0. School 6 is one of the EcoSchools with a silver level certification. It is located in the city of a thriving urban area (not an inner city school). School 6 is known for its high academic standards and advanced programs. School 6 had two EcoSchool teacher co-ordinators. The observations summary for each parameter is captured in Table 6.6.

Table 6.6

Summary of Parameters for School (6.0) Walk-Around Observation

PARAMETERS	OBSERVATIONS	RATING
Parameter 1: School ground greening	There is a quadrangle with a hint of evidence of greening (started but abandoned?). Area appears to be overgrown with weeds. Also evident was the fact that this space needed work and effort put into its' greening.	1
Parameter 2: Eco-boards	There was an eco-board observed in this school.	Existing
Parameter 3: Eco-boards materials.	There was also visible evidence that care had been table to put in thought challenging materials into this eco-board. There were plastics bottles illustrating the harm of plastic bottles to the society.	5
Parameter 4: Eco-board aesthetics.	Several materials on the eco-board were well thought out. Although there were environmental thought provoking display, eco-board could benefit from a more eye-catching colours in order to be call more attentions to itself.	4
Parameter 5 - EcoSchools awareness posters.	At the school entrance, a couple of EcoSchools posters were observed.	2
Parameter 6 - EcoSchools recycle bins/labels.	EcoSchools and recycle bins were very visible along most of the hall ways but the bins were not labelled.	4.5
Parameter 7 - Visible cues encouraging good environmental practice.	There were postings/headlines about eco-friendly activities (bottle recycling) just at the schools entrance.	2

Other observations. There was a battery recycling program but the location of the collection box was not obvious. Also, there is a quadrangle that could make a great green learning area if cleared and maintained.

School 7. School 7 is represented in the statistical analysis as Sch 7.0. School 7 is one of the EcoSchools with a silver level certification. It is located in the city (closer to the inner city but not directly within it) of a thriving urban area. School 7 had one EcoSchool teacher co-ordinator. The observations summary for each parameter is captured in Table 6.7.

Table 6.7

Summary of Parameters for School (7.0) Walk-Around Observation

PARAMETERS	OBSERVATIONS	RATING
Parameter 1: School ground greening	There was a park-like courtyard in the school. Other than the general school shrubs for aesthetics and the park-like area in the courtyard, no other visible evidence of school yard greening was observed. These green areas may or may not have been a direct result of a deliberate effort to green the school for environmental practice purposes, but the overall aesthetical effects, especially the courtyard, was quite pleasing to the eyes. Although the courtyard appeared to be a top-notch environmental school yard greening effort, it is not obvious that it is generally open for students to enjoy or for teachers to have an outdoor teaching experience. Furthermore, it is may not be quite conducive under the elements as an outdoor environmental space.	4
Parameter 2: Eco-boards	There was no eco-board observed in this school.	0
Parameter 3: Eco-boards materials.	Non-existing.	0
Parameter 4: Eco-board aesthetics.	Non-existing.	0
Parameter 5: EcoSchools awareness posters.	No EcoSchools' awareness posters were observed at the time of this study other than the recycling labels.	1
Parameter 6: EcoSchools recycle bins/labels.	The EcoSchools recycle bins were visible right at the school. Trios of EcoSchools metal bins (white, red and blue) could be seen right from the entrance of the school and along the hallways. The bins were well labeled with instruction on what goes where with EcoSchools posters. There were at least ten EcoSchools trio bins located at strategic positions around the whole school.	5
Parameter 7: Visible cues encouraging good environmental practice.	There were no other obvious/visible cues encouraging good environmental behaviour and practices other than the recycling labels and instructions.	2.5

Other observations. In addition to everything mentioned above, there was also well labelled compost and battery recycling bins available in the main staff room.

School 8. Represented in the statistical analysis as Sch 8.0. School 8 is one of the EcoSchools with a silver level certification. It is located in a sub-urban community close to a thriving urban area. At the time of the data collection, school 8 no longer had an EcoSchools' teacher co-ordinator. This former co-ordinator withdrew from this position prior to this study, but filled out the teachers' interview based on her previous experience in that position. The observations summary for each parameter is captured in Table 6.8.

Table 6.8

Summary of Parameters for School (8.0) Walk-Around Observation

PARAMETERS	OBSERVATIONS	RATING
Parameter 1: School ground greening	There is a visible outdoor greening activity although it is not clear if this was directly linked to the EcoSchools. There were park-like chairs and table/sitting areas at the location. It is accessible to students, or staff that may want to use it. Although great when the weather is spectacular, there may be a problem using this space when the weather is not very clement.	4.5
Parameter 2: Eco-boards	There was no eco-board observed in this school.	0
Parameter 3: Eco-boards materials	Non-existing.	0
Parameter 4: Eco-board aesthetics.	Non-existing.	0
Parameter 5: EcoSchools awareness posters.	No EcoSchools' awareness posters were observed at the time of this study, but there were EcoSchools tags on the EcoSchools recycling bins. There was an EcoSchools' flag flying high in front of the school.	2
Parameter 6: EcoSchools recycle bins/labels	EcoSchools recycling bins were present and noticeable right from the school's main entrance. Recycling label was not observed.	3.5
Parameter 7: Visible cues encouraging good environmental practice	There were no obvious/visible cues encouraging good environmental behaviour and practices other than the classroom light out instructions.	1

School 9. School 9 is located in the county close to a thriving city. It is a relatively brand new school with both elementary and secondary schools occupying the same building. School 9 occupies a unique position for a number of reasons. First, it is not one of the EcoSchools but the elementary school section is an EcoSchools with a silver level certification. Second, the EcoSchools teacher co-ordinator was in the elementary section

and confirmed that there was no cooperation in its' EcoSchools activity between the secondary and elementary schools.

As a result of the lack of EcoSchools activity collaboration between the elementary and the secondary schools, and for the purpose of this research, school 9 was classified as a non-EcoSchools, since the secondary section did not participate in any EcoSchools activities. The observations summary for each parameter is captured in Table 6.9.

Table 6.9.

Summary of Parameters for School (9.0) Walk-Around Observation

PARAMETERS	OBSERVATIONS	RATING
Parameter 1: School ground greening	Other than the aesthetics and school ground landscaping, there was no evidence of deliberate school ground greening for EE purposes.	0
Parameter 2: Eco-boards	There was no eco-board observed in this school.	0
Parameter 3: Eco-boards materials.	Non-existing.	0
Parameter 4: Eco-board aesthetics.	Non-existing.	0
Parameter 5: EcoSchools awareness posters.	No EcoSchools' awareness posters were observed at the time of this study.	0
Parameter 6: EcoSchools recycle bins/labels.	The EcoSchools trio recycling bins were not observed.	0
Parameter 7: Visible cues encouraging good environmental practice.	There were no obvious/visible cues encouraging good environmental behaviour and practices.	0

Other observations. The whole school is designated an EcoSchools (there was no differentiation between the elementary or secondary school), right from the entrance, there was an obvious and deliberate greening (more than a dozen potted plants) apparent on the elementary side of the school but was lacking on the secondary side. There was a also battery recycling programs located in the main secondary school's main office, but it was not clear if it was in conjunction with the elementary EcoSchools' program.

School 10. School 10 is represented in the statistical analysis as Sch 10.0. School10 is located in the city right in the core of the inner city. School 10 is one of the EcoSchools

with a silver level of certification. School 10 has one EcoSchools' teacher co-ordinator.

The observations summary for each parameter is summarised in Table 6.10.

Table 6.10.

Summary of Parameters for School (10.0) Walk-Around Observation

PARAMETERS	OBSERVATIONS	RATING
Parameter 1: School ground greening	There was no evidence of deliberate school ground greening for EE purposes.	0
Parameter 2: Eco-boards	There was no eco-board observed in this school.	0
Parameter 3: Eco-boards materials	Non-existing.	0
Parameter 4: Eco-board aesthetics.	Non-existing.	0
Parameter 5: EcoSchools awareness posters.	There were visible EcoSchools' posters around the schools and strategic locations (three posters observed on the stairs). Right at the school's main office, a plaque of the school's EcoSchools' status was on display. In addition, the EcoSchools' flag was flying high.	5
Parameter 6: EcoSchools recycle bins/labels	There were twin EcoSchools' metal recycling bins (white and blue) located in more than six spots all around the school. The red bins were missing. Labeling and instruction for what material goes into what bin was not observed.	3
Parameter 7: Visible cues encouraging good environmental practice	There were no other obvious/visible cues encouraging good environmental behaviour and practices other than those displayed with the EcoSchools posters.	3

Summary of School Walk-Around and Rating

The summary of the school walk-a-around and observations are displayed in Table 6.11.

Table 6.11.

Summary of School Walk-Around and Rating

School ID	# of EcoSchools' Teacher	EcoSchools Status	Level of Certification	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5	Parameter 6	Parameter 7
1.0	2	Yes	Silver	3	0	0	0	0	3.5	1
2.0	1	No	None	4	0	0	0	0	3.5	1
3.0	1	Yes	Gold	0	0	0	0	0	0	1
4.0	1	Yes	Gold	0	1	0	0	0	0	1
5.0	2	Yes	Gold	0	1	2.5	2.5	1	4.5	1
6.0	2	Yes	Silver	1	1	5	4	2	4.5	2
7.0	2	Yes	Silver	4	0	0	0	1	5	2.5
8.0	0	Yes	Silver	4.5	0	0	0	2	3.5	1
9.0	0	No	None	0	0	0	0	0	0	0
10.0	1	Yes	Silver	0	0	0	0	5	3	3

Note. Para 1 = school yard greening; para 2 = available eco-board; para 3 = Eco=board materials; para 4 = eco-board aesthetics; para 5 = awareness posters around the school; para 6 = recycle bins and para 7 = visible cues encouraging good environmental practices.

PART II: ANALYSIS AND PRESENTATION OF ECOSCHOOLS' TEACHER CO-ORDINATORS INTERVIEW

Three sets of interviews that were conducted. The main interviews were scheduled and were part of the original research plan. Two of the interviews were opportunity sampling that came up during the course of this research and it was expedient that such opportunities for candid conversations be taken in order to shed more light on the research topic and findings. The EcoSchools' teacher's co-ordinator interviews are analysed in this section while the school board EcoSchools program co-ordinator and a school principal's interview are analysed and presented in next chapter.

The succeeding chapter is organised by sections. The first section is the introduction where the demographics of the teacher participants and activities are chronicled. The other sections are organised as themes that emerged in the course of the interview analysis process. Main themes formed the basis of the sections and were organised as follows: teachers commitment to the EcoSchools program (minor themes discussed include the factors affecting teachers commitment to the EcoSchools program); promoting the EcoSchools program (this included things the teachers did to publicise and promote the EcoSchools program); opportunity for PLC connection; curriculum connections (including factors limiting curriculum connections); and finally, teachers perceptual assessment of the EcoSchools program.

Under the section, teachers' perceptual assessment of the EcoSchools program, the following were also covered: the status of the EcoSchools Program—good or bad idea; changes the EcoSchools has brought to the schools, necessary changes for a more efficient EcoSchools; how well the program was meeting its goals; its' most impressive

aspects and irrelevant aspect; and finally, the status of EcoSchools for fostering EL in students.

The final section presented various parting remarks and ideas offered by the participating teachers. The final remarks included teachers' personal thoughts and advice on the EcoSchools Program, EE, and EL testing in Secondary Schools.

Demographic Description of Participants

These 10 teachers coordinated the EcoSchools' activities in their individual schools. Of the 10 teachers, five were females and five were males. The teachers' years of experience ranged from 4 to 18 years. Average experience of the teachers was 11.1 years. Among the teachers, eight academic subjects were represented; the subjects were general sciences, geography, computer science, special education, environmental science, biology, chemistry, and mathematics (see Table 6.12 for a summary of the teacher participants' demographics).

Table 6.12

Summary of Teacher Demographics

Participant	Schools	# of Years of Experience	Gender	Eco-Clubs?	Subjects Taught
T1	01	13	M	Yes	Geography
T2	02	15	F	No	Geography
T3	03	9	M	Yes	Computer Science and Special Education
T4	04	10	F	Yes	Chemistry and Environmental Science
T5	05	18	F	Yes	Biology and Science
T6	06	7	F	Yes	Biology and Science
T7	07	10	M	Yes	Geography and Computer Science
T8	08	14	F	No	Science, Chemistry
T9	09	4	M	No	Math and Science
T10	010	11	M	Yes	Geography and Science

A Sense of What EcoSchools' Teacher Co-ordinator s Do

All participating teachers except T2, T8, and T9 reported that their schools had an eco-club and they were all members of these clubs (T2 was in a non EcoSchools, T8 just

resigned from the position of the EcoSchools teacher co-ordinator , hence, the school had no functioning eco-club for the year and T9, although reported having an eco-club, the club did not include the secondary school arm, hence, it was reported as not having an eco-club in the analysis).

From the response of the teachers, what the EcoSchools teachers did as co-ordinator s can be categorised fewer than two broad headings: activities within the school community (with students and among their colleagues) and activities outside the school communities.

Activities outside and within the school community. Teachers reported participating and organising outside school activities like Marina clean-up and community tree planting. Also, eighty percent of the teachers reported having an eco-club. Teachers that reported they had an eco-clubs, met at least once a month, while the most frequent meetings reported were twice a week. All teachers with an eco-club also reported having students in all grades levels in their schools represented in the club except school 08 that reported participants to be from grades 10 to12 only.

Activities within the school community included guiding the students while they participated in various eco-club activities, helping the eco-team with organising the EcoSchools activities (e.g., water bottle fundraising), educating the school community on current local and global issues (e.g., through eco-board posting), organising eco meetings, and creating awareness posters, promoting different environmental-based activities within and around the school, and completing paper work for the EcoSchools accreditation process.

The teachers were also involved with promoting several activities with the schools. For example: waste management program (education) within school community,

tree planting, courtyard gardens and around school ground up keep, waste management, organising and facilitating environmental-based events in schools (e.g., assemblies), announcements, recycling, vegetable garden, promoting environmental curriculum to colleagues and heading PLC groups, diminishing students' nature deficiency, school yard greening, organising field experiences.

Also, teachers reported being involved with completing paper work for accreditation, like energy auditing, promoting and implement program on energy education, waste audits, submitting EcoSchools portfolios (for certification), attending the EcoSchools training and ensuring that student representatives attend too, and collaboration with other eco-team member to share ideas and make plans for better environmental stewardship.

Finally, half of the teachers also reported helping to disseminate information. They indicated having an eco-board where they published environmental–based information for the perusal of the school community.

Coordinating Teachers' Commitment to the EcoSchools Program

Teachers were asked to rate their level of commitment to EcoSchools on a scale of 1-5 (with 1 representing not very committed and 5 representing very committed). Among the teachers interviewed, nine of them provided a rating for their commitment level. Three teachers rated their level of commitment as a level 5, two teachers rated it as level 4 and one teacher as a level 3 and finally, two teachers rated their level of commitment as a 1. The explanation for this range of rating included time, lack of human interaction, personal sense of duty to the commitment, believe in the goodness of the program, and performance level. These explanations are discussed as factors influencing teachers' level of commitment to the EcoSchools program.

Time. T9 stated, "I wished I had more time to commit to improving the program". Another teacher agreed with the time constraints and added that being over-committed already with very limited help from other sponsoring teacher limited her productivity with the EcoSchools program. While others (e.g., T2) stated "time factor to organise and commit to regular meetings; [with] so many other activities for example, work schedules, sports, clubs, and transportation factor [taking precedence]" as being a hindrance to her functionality and her commitment level to the EcoSchools program.

Lack of human interaction. T8 reported lack of human interaction with the program and reflected that having someone who you can communicate would be very welcomed. This teacher also indicated that they were no longer a member of the team as a result since they could not relate to this situation as a result, their commitment has petered out. T8 said the reference to lack of human interaction was mainly due to the fact that most things were done online and there was very limited interaction with the EcoSchools program initiators.

Personal sense of duty to their commitment. A sense of duty in their commitment seems to be the motivating factor for some teachers. An example of this sense of duty was reflected in statements like "I must be 100% committed when I decide to take a challenge" (T4). Others simply stated that their personal desire to see it work is what keeps them going.

Belief in the goodness of the program for EE. A number of teachers tend to agree that the EcoSchool is a good program for the environment. A teacher stated the importance of teaching young people to take care of the environment, and another (T6) said "I think the students enjoy being part of the club. It offers many of the students

something to be part of. Some are interested in this field [environmental] for their future careers.

Performance level. Some teachers based their commitment rating level on how well they are completing their EcoSchools obligations. For example, one of the teachers (T4) who rated their commitment at a level 4 based it on the fact that they (school) were really good with their recycling and energy audit program but still needed some improvements with waste food composting.

Other Teachers Commitment to the EcoSchools Program

Teachers were asked how well other teachers embraced the EcoSchools program. Answers from participants varied from passive to fairly high level. Among the teachers reporting a fairly high level of involvement of other teacher, T10 stated that "70% [of other teachers] embraced the program by changing their day to day habit or curriculum" to have a more environmental outlook.

T9 stated that they found it "difficult to break through to people who have not been overly concerned about the environment all their lives".

Another T5 pointed to other teachers' participation in the recycling program and ink cartridge recycle as an indication that they approve of or are embracing the program. Additional example of what other teachers do to show their participation included "turning off lights when not needed" (T4) and educating their students about environmental concerns and encouraging them to participate in the EcoSchools program.

One T6 stated that "they [other teachers] often shared their input on our recycling program, courtyard restoration project…and bringing reusable containers to school. In relation to this, a teacher said other teachers ask him to recycle their stuff for them.

From the teachers that reported a mixed signal in terms of support for the program, T3 stated that although other teachers agree with the principles of the EcoSchools, they are not motivated or show any interest in participating. One of the teachers thought this level of passive involvement was related to the high number of initiatives in the school that the board required the teachers to embrace (T2).

Publicising the EcoSchools Program

Teachers were also asked if they encouraged students to participate in the EcoSchools program and how they went about it. Publicising the program also included what the teacher co-ordinator s did not encourage participation from other staff members. All the teachers stated in their answers that they encouraged the students to participate in the EcoSchools' program, but the way and rate at which they were doing it differed. The common trend emerging from their answers included the following ways.

Publicising EcoSchools to students. Through the courses/lessons/classes they teach especially environmental related courses like geography, environmental science and the other sciences. T10 stated that "students had no choice but to help out with environmental initiatives" since he has expertly merge the curriculum with the program. Another T7 indicated that he weaved the program into environmental issues lessons as a way of "getting students to participate in environmental initiatives and possibly spark an interest in joining the environmental club at the same time". A teacher also stated that she tells her class to join the group in order to receive community hours.

Other ways teachers said they used for encouraging students participation included the following: through word of mouth; the schools' morning announcements; signs and poster around the school; and selecting students for the EcoSchools training in hope that they will spearhead future initiatives.

Publicising EcoSchools to teachers. Another question that touched on publicising the EcoSchools program was the one that asked the teachers how they passed along the core teachings of the EcoSchools to other members of the school community including teachers and other students not member of the eco-team or eco-club.

Responses were mainly within three categories which included teaching, actions (role modelling or show by examples), and words of mouth. Other avenues included morning announcements and e-mails to staff. For example, a T5 responded that they visited classrooms the previous week, where they taught lessons about algae blooms to various classes, had morning announcement for EcoSchools agenda and emails staff on EcoSchools related matters.

Curriculum Connection

From the EcoSchools facilitator interviews, questions 20 to 22 (see Appendix E) were related to the curriculum content of the EcoSchools program. Teachers were asked if they were aware of the available curriculum resource on the EcoSchools website, they were also asked if they have used these materials for teaching in their classroom, and finally, whether they have used the materials. Teachers were also asked to comment on the relevance of these materials (for those who used it). Finally, participants that had not used curriculum resource were asked to provide a reason for that.

The teacher responses showed that all of them except T2, who indicated that they were somewhat aware, were all fully aware that the EcoSchools' website had curriculum materials that were relevant to various subjects. Half of the teachers said they had used the EcoSchools curriculum materials and resources available online and the other half said they had never used these curriculum materials.

Factors affecting the use of EcoSchools curriculum materials. The emerging factors for those that had not used the materials fell under the following categories: time, relevance and lack of consideration.

Time. A number of the teachers sighted time as a factor or deterrent to perusing and using the materials. For example, a T2 stated: "I have not taken the time to investigate the website in depth". T6 corroborated this factor with the statement: "I need to take the time to look at the material and forward it to the appropriate teachers" who may find it useful.

Relevance. The second factor that teachers did not use the curriculum materials cited was the issue of relevance. Some did not use curriculum materials because they were not relevant to their specific subject, others found the curriculum materials to have very little application to the subject they were teaching.

Lack of consideration. Finally, T9 stated that they never used or thought to use these EcoSchools curriculum material because they never gave it a thought. In their own words, they said "I just never thought to [use it]" (T9).

Teachers' Perceptual Assessment of the EcoSchools Program

Several of the questions from the interview were centered on teachers' perceptual assessment of the EcoSchools in the following areas: the noticeable changes (if any) the program has brought to their schools; what they think needed to change (if any); whether the program was meeting its goals; what they found most impressive and most irrelevant about the EcoSchools program; and finally, if they believed the EcoSchools program has promoted or improved EL in high school students. Their responses are summarised under the emerged themes: EcoSchools—a good or bad idea; positive environmental changes in school due to the EcoSchool program; making the EcoSchools more effective;

EcoSchools meeting its goals; EcoSchools most impressive aspect; programs most irrelevant aspect; capacity to promote EL among students.

EcoSchools: A good or bad idea? All the teacher participants unanimously agreed that the EcoSchools program was a good idea with some teachers dubbing it an "amazing" (T10), "great" (T7), or "excellent" (T4) idea. Some other teachers, although taught it was a good idea, they were skeptical to state that it was successful. The various answers participants gave to support why they thought it was a good or not a really good are discussed in the following sections: positives comments on the ideas of the EcoSchools and; non-positive comments on the idea of the EcoSchools.

Positives comments on the idea of the EcoSchools. Teachers see the EcoSchools as a good idea, as one T2 puts it, the program "increases environmental awareness both inside and outside at home, work, etc." several of the teachers lauded it as a good idea because of its overarching message of promoting environmental awareness both on the inside and outside of the school community.

The following comments were made in line of the EcoSchools' program promoting environmental awareness: "It promotes a green message to protect our earth" (T3); "It is one of the excellent programs as it helps us to focus on the immediate environmental concerns and needs. It is an excellent resource to provide recycling and other environmental education to our students" (T4); "It raises environmental awareness among our students and staff. It is also a way for us to do something positive, to be a part of the solution and not just the problem" (T7); and "amazing…It is a must in every school to foster respect for the environment" (T10).

Non-positive comments on the idea of the EcoSchools. For T1, they believed the program was a good idea in theory, but stated that "being an EcoSchools [has] more to do

with adhering to the fairly strict regime of activities that [were] not in line with what students really want[ed] to do. Many of the activities we do as a club don't always 'count' for points according to the EcoSchools". T8 said the EcoSchools' program needed "better conversations with board [and] human involvement" since they found the overly online-reliant process very impersonal. T8 also indicated that it would be great to have personnel who came in at regular interval to help it with whatever issues they may have.

Changes the EcoSchools program has brought to schools. When asked if the EcoSchools' program has brought any change to the schools, all the teachers agreed that the program has brought one form of noticeable change or the other. The majority of the teachers agreed that the EcoSchools program has created more awareness when it came to recycling and energy use.

Overall, EcoSchools' teacher co-ordinator s identified eight different areas where there has been a perceptible change as a result of the program. These areas included: recycling, waste reduction, re-useable bottles, energy use, students' efforts in environmental initiatives, school yard, and overall school environmental efforts/awareness, as well as available resources.

Environmental awareness. Teachers agreed that their school community (students, teachers and immediate community) have become more aware of their action as it relates to the environment. T10 reported seeing 90% of their colleagues and students walking around with reusable bottles instead of one single use plastics. Students were also putting in effort to achieve their gold certification (T4). T1 noted the recent installation of a water refilling station in their school as an attempt to eliminated plastic water bottles.

Recycling. Most of the teachers pointed to an overall improvement in recycling as one of the major changes the EcoSchools has brought. To corroborate, T1 stated: "we

have dramatically improved out recycling efforts" More comments along the improved recycling practice: "More awareness around recycling [around the school]" (T2); and finally "we have created a culture of waste conscientious students can be heard saying 'that is recyclable' or 'why didn't you use a reusable water bottle" (T6).

Waste reduction and energy use. Some teachers reported a noticeable reduction in energy use. For example, T3 noted that his school has had a 10% reduction in annual energy use and a 4% annual reduction of waste generated. T2 also noted the increased awareness around energy consumption was a direct outcome of the EcoSchools program.

Available resources. A participant claimed that being part of the EcoSchools program has given their environmental club the resources to take on larger eco-friendly initiatives by connecting them to people, ideas and funding that would have otherwise been more difficult to attain if they were not part of the program.

Overall school environmental efforts. Other school environmental efforts noted by the teachers as visible changes that were due to the EcoSchools activity included: creation of an outdoor classroom (T2), improved school yard (05), "a nice focus as to what school can do to improve their environmental impact" (T9).

Making the EcoSchools more effective: Change necessary. On the issue of what needed to be done to make the EcoSchools more effective, teachers readily provided a list of suggestions for improvement. The propositions by teachers were categorised into five broad themes: Changes centered on infrastructure; administrative teachers, students, and the EcoSchools program. The recommendations for change are discussed in the following sections.

Infrastructure changes. The change suggested in this category centered on the school building. T1 noted that their school was a "building with old traditional utilities,

i.e., lead pipes" and to become more environmentally friendly "it would require financial input" to change the lighting and water pipes. For this participant, they believe that infrastructural conditions had to reflect environmental practice and teachings.

Administrative. The change suggested in this category centered on the school administration and the board as a whole. T1 suggested more administrative support in environmental activities and initiatives in schools, for example, a general administration support when the EcoSchools plan their activities. T2 advocated for a reduction in the number of ministry/board initiatives in order to focus more on 'necessary' initiatives like the EcoSchools program.

Teacher manpower. The teachers believed that extra manpower was required for planning a successful EcoSchools' program. T6 suggested getting other teachers involved and providing specific duty for all participating teachers. Similar to T6, T3 and T10 also agreed that other teachers' involvement would help improve the program by reducing the workload on a particular co-ordinator and creating more awareness for EcoSchool. T10 stated that "more teacher[s] help [is needed in] facilitating [the] EcoSchools program".

T6 proposed that since the planning and overseeing of the whole program required a major time investment and even summer time input when the maintenance of the outdoor greening was taken into consideration; specific allotment and/or release time should be provided for co-ordinator s. This way, they are not carrying excessive and overwhelming workload.

Students' involvement. A number of teachers agreed that students' involvement with the program needed to improve drastically. T5 suggested getting the grades 9 and 10 on board with the program, while T7 suggested that for a more effective EcoSchools program, "more consistency [is required] when it comes to participation among the

student body." Overall, the teachers feel that the total number of participants in the program was underwhelming.

Program composition and requirements. Some teachers suggested that the overall composition and requirement of the program needed to change in order to make it better. T9 commented on the overwhelming amount of paperwork that must be completed for the certification process. They said "it would be nice to receive outside support/guidance as to what we [have] to do". T8 advised that the program should "stop doing everything on-line" reduce online activities and increase human interaction in the program in order to make it better.

EcoSchools meeting it goals. Teachers assessed the EcoSchools on how well it was meeting its' goals. The answers varied and several of the teachers were not very emphatic in agreeing that the program was meeting its overall goals. Teachers were asked whether the EcoSchools was meeting its goals, answered varied from few yeses or no without explanations to non-emphatic yeses or conditional answers.

The following range of responses captured the overall feelings of the teachers on whether the EcoSchools was meeting its goals: "Yes, but there is always room for improvement" (T10); "no" (T8); "I believe it has fostered the goal of creating a community of eco-friendly mind people. It has allowed us to connect with each other and share information and ideas (T7); "I think so" (T7); "most, still needs to improve waste reduction" (T5); "Somewhat; dependent on school and commitment of staff and students" (T2); "I guess it is meeting its goals in terms of political agenda – schools can become involved and a process is in place to make it seem like goals are being met" (T1).

EcoSchools' program most impressive aspects. Teachers were asked the aspect of the EcoSchools they found most useful, impressive or relevant. They referenced the

following: students' engagement; EcoSchools annual training; waste and energy audit; best practices; and outdoor education. These aspects are discussed in the following section.

Students' engagement. Teachers' were impressed on how well the EcoSchools program incorporated students' participation and captured their engagement. T1 deemed it "way more effective when students were in charge". They particularly liked the fact that it was slowly shifting from a teacher to students led initiative.

EcoSchools annual training. Some teachers applauded the EcoSchools annual training. T2 commented on the excellent guest speakers and how well it was organised. They characterised the workshop as very informative. T3 firmly agreed that the training and PD workshop provided for the EcoSchools' teachers was the most useful and impressive aspect of the program.

Other teachers agreed that the annual training was an impressive aspect of the EcoSchools program as it presented them an opportunity to engage in a professional learning community (PLC). In support of this PLC opportunity T7 wrote: "It allows all of us to come together to bring our ideas and share those ideas with all the other schools within our board."

Waste and energy audit. A number of teachers touched on the waste and energy audit and expressed how they liked the fact that it kept them on track. T5 commended it and said that " [it provided us] actual data –waste and energy audit- [that] lets us know how we are doing and where we can improve. T4 also agreed with the waste and energy audit being the most impressive. They supported this by saying: "I love the waste and energy audits as it really gives us better idea of what's going on and what can be done".

Best practices.T6 commends the best practices e-mail she gets as the best aspects of the EcoSchools program. They said this inspired them to try new things knowing that there was someone they could ask, and see samples of a successful activity from another colleague.

Opportunity for outdoor education. T8 and T10 lauded the opportunity for outdoor education as the most impressive aspect of EcoSchools. T10 loved the opportunity for outdoor education that the program provided for teachers and students. T8 stated that "school involvement in bringing students outside" was a very useful aspect of the EcoSchools that emphasized the importance of outdoor for EE.

EcoSchools' program most irrelevant aspect. On the aspects of the EcoSchools program teachers found most irrelevant, teachers' response varied from not finding anything irrelevant to a couple of suggestions on things they felt were redundant and cumbersome. Co-ordinator s mentioned the following as irrelevant and redundant aspects of EcoSchools: Some aspects of scoring—especially the waste and energy audit (T1); cumbersome certification process (T2); resources on web not being relevant or very limited for teaching in several subject areas (T3); time consumption of required paper work (T9); means of tracking work done (T8); and nothing irrelevant (T5 & T10).

Has the EcoSchools program promoted or improved EL among high school students? Teachers were asked if they thought the EcoSchools promoted and/or improved EL among students. Three themes were identified from their answers. They were: Emphatic yes or no and an uncertain yes. The themes are discussed in the following sections.

Yes, the EcoSchools promoted and/or improved EL among students.T4 believed that the EcoSchools program promoted and improved EL among students. They were

confident of this fact as a result of the students' regular participation in various EcoSchools activities, how much they really loved conducting audits and share the information and finally, their enthusiastic participation in the 'Animal Abuse Campaign'. These, T1 concluded were all evidence for them to conclude that the program promoted EL.

Also, T7 believed that the fact that they were getting the school involved by carrying out eco-friendly initiatives and campaign allowed them to educate staff and students on various issues that promoted environmental change within the school and the greater community. T7 believed that it was a main part of EL.

T5 emphatically agreed that the EcoSchools promoted EL among students in their school. They based this conclusion on the following assumptions. They explained that the "core values [EE] have become embedded in [their] school, students are quite aware of many of these issues." T10 also believed that the EcoSchools program has promoted and/or improved EL among students (or can achieve this) if executed in the right way since it promoted "an inner appreciation of the beauty and majesty of the earth."

No, the EcoSchools has not promoted and/or improved EL among students. T3 believed the EcoSchools has not promoted or improved EL among students, but also insist that the situation could be easily remedied by making the program more cross-curricular and not limited to the EcoSchools coordinating teacher alone.

Maybe the EcoSchools somewhat promoted and/or improved EL among students. Some of the teachers were not very certain if they could conclusively say that the EcoSchools program promoted EL among students. T1 in their statement to support this uncertainty said: "it [was] hard to tell, [because] for a small number of students, yes. However, I feel at the secondary level, only students who want to join the enviro-club

benefit [ed] — we are working at this." T2 believed students were conversant with the vocabulary and objectives of the EcoSchools program, but needed to be empowered to take more actions since they displayed a lot of apathy towards participation.

Furthermore, T6 could not give a straight answer, but stated that students were getting some information through their events and activities. T6 thought that they will have to continue to be consistent and try various approaches to reach more students; since participating will ensure that environmental information from the EcoSchools is disseminated.

T9 stated that they would like to say yes that the program promoted EL but did not know for sure. On the other hand, they are certain that the program was making students aware of the issues that are affecting our world. T9 believed that the program has created an avenue for more discussions about the environmental and what everyone can do for it.

Final Remarks and Advice on the EcoSchools Program, EE and EL Testing in Secondary Schools.

Teachers were asked to leave a parting remark or advice on EL testing, EE and the EcoSchools program. Four themes emerged from the answers they provided. They included: comments that centered on teacher and program support; comments centered on students and responsibility; EcoSchools duty allocation; and the curriculum.

Teacher and program support. Several teachers' commented on the aspect of the program providing them with more supports in the areas of policy, financial, resource sharing and incentives. T1 stated that the current policy on community garden will have to be amended in order for the program to expand in this area, not only this, extra financial support will be necessary to embark on this project.

Another area the teachers remarked that they required support was in listening to and solving EcoSchools problems not just ignoring them. T8 emphasized that addressing their problem will reduce their frustration level and allow them to forge ahead.

T3 emphasized that participants should be encouraged to share more resource and success stories in order to provide more incentive (extrinsic motivation) and encourage intrinsic feelings and achievement. T7 maintained that "schools should be used as a centre piece (role model) for change within the community".

Students. Some teachers believed that there needs to be the fostering of a greater sense of responsibility among students to protect their world and take responsibility for their foot print (T9). In doing this, they can make sense of their participation. Also, T9 supported the assignment of community hours for participation in environmental programs.

Duty allocation. Teachers expressed their frustration in the amount of time required to complete the EcoSchools obligation. To counter this, T6 recommended an official splitting of duties between sponsoring teachers and assigning specifics duties to each.

Emphasis on curriculum. The last set of comments centered on the curriculum. T2 proposed that more emphasis should be place on outdoor education so students can fully experience their environment and the things around them using all their senses frequently and T2 insist there should be no more testing of any kind in schools.

PART III: ANALYSIS AND PRESENTATION OF THE ECOSCHOOLS' PROGRAM CO-ORDINATOR AND PRINCIPALS INTERVIEWS

Interview of the school board's EcoSchools Co-ordinator and the principal provided information relating to the program to give a better understanding of how the EcoSchools worked in their board.

The school principal felt she had observed somethings with the program that might shed some light on some observations I may gather from her school. The principal's interview was of the structure of an informal conversation. The principal mainly focused on what she sees as obstacles to the progress of the EcoSchools in their school and what had deterred it from being a participating member of the program. The EcoSchools' Program Co-ordinator's and the principal's interviews were analysed separately.

School Board EcoSchools' Co-Ordinator's Interview

There were a total of twelve questions presented to the board EcoSchools' co-ordinator. A copy of the questions can be found in Appendix F. From the board EcoSchools' co-ordinator's answers, the following themes emerged from the conversation: assessment yard stick for the EcoSchools program; information dissemination; composition of the board eco-team; success levels in schools; workshop/nature of workshop; and ensuring continuity of the program. The themes are presented in the subsequent section.

EE, EL Assessment Yard Stick in the Board

The EcoSchools program is tied to the Ontario curriculum and also has a myriad of resources for teachers to use. The Co-ordinator was asked if the board or the program

had any assessment/yardstick in order to gauge what students are gaining from the program.

The Co-ordinator stated that there was no formal assessment per se, they as a school board used the success of the certification process as a success criteria, since an aspect of the certification process is where schools can show participation is in the curriculum. Schools will have to give examples of places they have used these materials to earn scores during the certification process.

Information Dissemination

The Co-ordinator was asked how they made teachers aware of the vast and rich information available from the EcoSchools program. He identified two ways that his team disseminated information to the co-ordinators. The first was that all the teachers were privy to the EcoSchools website where they can find curriculum materials. He stated that "we [board eco-team leaders] also remind them in [our] EcoSchools straining every year about resources, how to access them and sharing resources during the trainings."

The second method of disseminating information to the teachers was by the EcoSchools mascot, Mr. Rribbit who "communicates through email throughout the year with the teachers; give them directions on certification, energy, and recycling information. Mr. Rribbit is like "the voice behind the steering committee and a way of getting information across to our schools."

Composition of the Board's Eco-team

The board's EcoSchools team is made up of a steering committee. The committee is composed of the following people: program co-ordinator, co-ordinator engineer—who oversees energy; the energy officer; the person who oversees operations for recycling and garbage collection—who represented facility service for the recycling effort, helped

provide fund and resources for schools, to enable them implement recycling. The other thing he does on the committee is that he helped co-ordinate with any landscaping or greening projects happening in schools. He is also there to give them guidance and assist them on greening projects in schools.

Also on the committee are retired elementary and secondary school principals; two teacher representing the curriculum—one is retired and the other still active; two science representatives; one member with an arts background; a member involved with community efforts (e.g., parents, children, healthy eating and healthy eating and healthy life styles) and lastly; and finally, a PR person.

Success Levels in Schools

The Co-ordinators commented on the participation of the schools in the boards. He said that all the every schools are supposed to have an eco-team (board mandate), and currently, about 75 – 80% of the schools apply for certification which amounts to a participation level of ~75-85%.

The Co-ordinator was asked if the elementary or secondary schools have had more success in weaving ecological literacy provided by the EcoSchools material and resources into the curriculum and why.

Co-ordinator stated that there was "a sense of greater passion in the elementary school than the secondary schools." When urged to speculate on probable underlying reasons, he said: "I think the mind in elementary school is able to be nurtured more and get excited easily on new things and new learning." He further stated that "secondary school students have seen it [EcoSchools program] in the elementary and they may not have the same passion. I think what you start to see on the secondary side is people are starting to become more of a leader; more involved around environmental issues-picking

it up more seriously. It may not be the same number, might have a lesser number in some ways there are less people involved but the individual that are involved might have a deeper passion."

He did not comment of teachers' role in ensuring that the curriculum materials provided by the EcoSchools were utilised.

Workshop and Nature of Workshop

The Co-ordinator was asked about the nature of the workshops. He stated that there were two types: a mandatory and an optional workshop. The mandatory workshop is held annually. It involves a full day of training where the board brings all eco-teams from every school together. This workshop has about 500 people in attendance. He said that there is usually a guest speaker at the end of the day that is there to re-ignite or re-energise the passion of the eco-teams. Typically, he said the board organised workshops on the following topics: waste and recycling; energy and energy conservation; greening projects; and how schools can become more involved in the greening projects (e.g., tree planting, landscaping, and butterfly gardens).

Also, there was a panel discussion around the end of the day when eco-teams are allowed to share their successes and challenges—this gave the participants more opportunities for sharing at the end of the day. The non-mandatory workshops were the ones they provided in the evening for persons interested in learning something specific about greening, certification process or a specific part of the EcoSchools program.

Ensuring Continuity and Support

In terms of ensuring continuity, being proactive and introspective, the Co-ordinator was asked if there was any information he would want [researcher] to ask the

teachers and the students in order to further strengthen the EcoSchools program and ensure its sustainability.

The Co-ordinator's reply was "we have asked that question in the past. Every year we ask them at the workshop what more do they want. How can we help them or assist them? We talk about resources; we talk about recycling containers. So we ask that question every year. The big struggle is participation and sustaining it."

Further, Co-ordinator was asked if they provided any other monetary support other than the $500 incentive for participating schools, especially for schools embarking on large process that may exceed the $500 capital required. He mentioned that the board financed the project through two different ways: minor capital money for greening project; and a line of budget set aside for landscaping.

Savings Resulting from Participating in the EcoSchools Program

In terms of estimating the saving resulting from the board participating in the EcoSchools program, the Co-ordinator replied that it was a little bit hard to measure but made the following statement to explain his stance: "I think there is a potential for saving on the electricity for about 10%, approximately $100, 000-$200, 000 per annum.

The Co-ordinator also noted that the other place where there might be an opportunity to save is in recycling and garbage reduction. He suggested that if you remove or reduce the amount of garbage, then you are not paying that amount for pickup. So it is not all about energy, it can be about recycling. "There can be recycling saving that come out of the EcoSchools program" he said.

The Co-ordinator also commented on the idea for platinum certification more specifically by stating that there were no platinum levels of certification but two schools have expressed interest in going for a platinum level certification. On the programs

preference for a specific subject teacher, he said there was no preference for a particular subject teacher to be the EcoSchools' co-ordinator. They can be any subject teacher as long as "there is a passion, a desire, interest. We just leave that to the schools to select" said the Co-ordinator.

School Principal's Interview

One of the principals participating in this research felt it was beneficial that they commented on the status of EcoSchool in their school when they was informed of the objective of the research. The principal felt that it would shed more light on the state of the EcoSchools program in her school.

The Principal expressed some of her concerns and asked vital questions that she felt must be addressed in order for her schools eco-team to have greater success. She insisted that EL as it concerns the EcoSchools (in her school) cannot be studied and described in isolation without taking into consideration the makeup of her school's eco-team and the parts they played.

After taking a look at the principal's comment in the conversation, the key theme emerging were concerns or shortcomings of the EcoSchools program in her school and what needed to be done to have a thriving program. Her concerns centred on the members of the team that were not effectively participating and fulfilling their designated responsibilities. Below is a transcript of our short conversation. It is not broken further into themes since the theme in all the conversation sections is deemed to be the same, that is, concerns or shortcoming of the EcoSchools program in her school and what needs to be done to have a thriving program.

Interview Summary

Principal: I have a problem with an eco-team that expresses lack of concern when call to come play their part. The custodial staffs that are supposed to be a part of this program are very reluctant to play their role.

Researcher: What makes you say that? It looks like you are not too impressed with the way things are going?

Principal: I have one issue, I want someone to tell me why the teachers and the custodial staff will go through the same training yet the custodian claims they are not responsible when it came to playing the part they were assigned. The training becomes unnecessary and a shear waste of resource.

This custodian does not have to be part of this team if they are unwilling to show any interest in participating. It is frustrating when the custodian claims they have no part in the program and delegate all the duty to the teacher yet they are supposed to be a part of the team.

I liken it to the case of the wrestling coach that I just received. He was a champion coach from his precious school and he also became a champion coach with my school's wrestling team while his former school's wrestling team suffered because he was no longer there. The EcoSchools have to figure out a way to sustain interest and find teachers and participants that are willing to do the task and champion the EcoSchools program.

Researcher: Any other remarks you'll like to add?

Principal: [Without hesitation] I think the key to success is the lead teacher's stance, give me a teacher with passion, then you have a thriving program. You need a champion teacher who is really into the program, when they move, the program collapses.

CHAPTER 7

DISCUSSION AND CONCLUSIONS

There have been arguments by scholars (Puk & Behm, 2003) that the mode of delivery of EE in Ontario is not effective enough to affect EL among students. On the other hand, creators of the EcoSchools program laud the program as promoting environmental literacy. As a result, this research was designed to achieve the following purposes: 1) investigate the level of students EL and their involvement in the EcoSchools program; 2) assess the impact of EE programs (the EcoSchools program) on students' EL in an Ontario school board; 3) determine the visibility of an EcoSchools programs and its' role in creating general environmental awareness among students; finally, 4) investigate students' sources of environmental knowledge and where the EcoSchools program stands in terms of contributing to students' environmental knowledge.

To achieve the research purpose and address the questions, data were collected in three phases. In the first phase, the MSELS (see Appendix A) was used to assess students EL, and the EcoSchools Questionnaire (see Appendix B) was used to collect data on the visibility, level of awareness of the EcoSchools program, and finally, students main source of environmental knowledge. A total of 625 students were surveyed from 10 secondary schools and one teen organisation.

In the second phase of data collection, 10 EcoSchools teacher co-ordinators, board program Co-ordinator and a principal were interviewed. Teachers interview were in a written format, while an oral interview was conducted for both the school board EcoSchools program Co-ordinator and the school principal.

The final phase of data collection was a school Walk-Around. A rating sheet (see Appendix G) was used for observing the visibility of the EcoSchools program. It also

served as a triangulation data cross check for students' report of the EcoSchools visibility in their schools.

The following research questions guided the study:

1. What is the EL level of students in the surveyed school board (using Roth's EL continuum and Ontario grading levels)?
2. Do students in schools with EcoSchools program demonstrate a higher level of EL compared to students in schools without EcoSchools program?
3. Do students in schools (with gold, silver or no level of EcoSchools certification) display different levels of EL?
4. Do students in county schools and students in city schools display different levels of EL?
5. Do students' EL scores vary across grades (7 to 12)?
6. How aware of the EcoSchools program are students in the schools with the EcoSchools program?
7. Does students' level of awareness vary with the level of their school's EcoSchools' certification (gold, silver or no certification)?
8. How do students rank the EcoSchools program as a source of environmental knowledge?
9. How do the EcoSchools teacher co-ordinators' perceive the EcoSchools program (what they did, what was great, and what needed to change)?

Research Findings on Students' Overall EL

Students' EL was the sum weighted total of all the EL components: environmental knowledge, environmental affect, environmental responsible behaviour and environmental skills. For all the participants in this survey (n = 586), the mean EL score

was 62.76%. Table 7.1 displays the schools EcoSchools status, characteristics of other variable and their mean EL scores. Interestingly but not totally unexpected, the eco-club posted the highest mean on the EL assessment, while the Teen organisation (mixture of elementary and secondary school students, mostly students from lower socio-economic status) had the lowest average among the groups surveyed. The scores of the eco-club are in line with other research findings; Hart and Nolan (1999) observed that in most cases, "the environment-related experience was found to have a positive effect on knowledge, attitude and predisposition to action or responsible environmental behaviour" (p. 7).

Table 7.1

Schools EcoSchools Status, Characteristics of Other Variables

Schools' ID	EcoSchools' Status	EL Mean	Schools' Location	Schools' Level Of Certification
1.0	EcoSchools	67.13	County	Silver
2.0	Non-EcoSchools	59.23	County	-
3.0	EcoSchools	56.81	City*	Gold
4.0	EcoSchools	61.05	City*	Gold
5.0	EcoSchools	67.20	County	Gold
6.0	EcoSchools	65.24	City	Silver
7.0	EcoSchools	68.40	City	Silver
8.0	EcoSchools	63.91	County	Silver
9.0	Non-EcoSchools	61.41	County	-
10.0	EcoSchools	61.58	City*	Silver
Eco-Club	EcoSchools	72.58***	City	Silver
Teen Org	Mixed**	51.49	City*	Mixed**
Total		62.71		

Note. *Inner city schools

**students in this location attended both Eco and non-EcoSchools.

***Top EL mean score

Summary of EL by grades levels. EL was lowest in Grades 7/8 and 9 (n = 4, 49.13% and n = 23, 49.23%). EL across Grades 10 to 13 were n = 227, 62.72%; n = 146, 64.21%; n = 180, 63.47% and n = 2, 65.87% respectively. It should be noted here that the Grades 7/8 and 9 in this study were sampled from a single school unlike the Grades 10 to 12 students that were dispersed across the board.

Test statistics (Table 5.11) revealed that the scores of Grades 7/ 8 students did not differ significantly from the scores of students in other grades. However, grade 9 students' EL scores differed significantly from the scores of the Grades 10, 11, and 12. Figure 7.4 displays the EL mean score of the grades.

Interestingly, if a line of best fit is drawn, it can be inferred that students EL increased with grade levels. The increasing EL from Grades 7-13 is in line with Roth's (1992) observation that EL is a continuum, which grows as students matures and acquires more knowledge and skills to tackle environmental themes and issues.

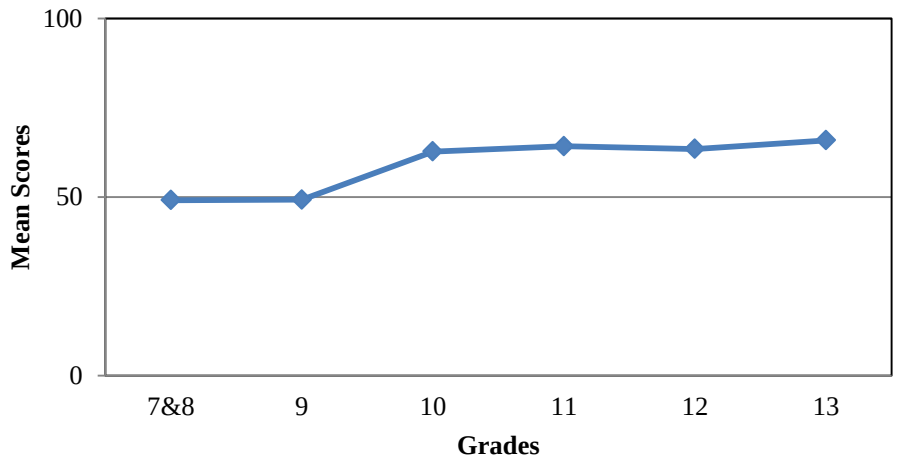

Figure 7.1. Mean EL score sfor grades

Summary of EL in city and county schools. The county school students scored significantly higher than the city school students, in the EL assessment; 64% (n = 352) versus 60.62% (n = 229) respectively. A plausible explanation for this observation was likely due to the closeness of the students in the counties to the natural environment. This conclusion is in line with Foster & Linney (2007) suggestion that dwelling in a natural environment has a positive influence and instilled in people a greater appreciation for

nature and more empathy to its preservation and upkeep as opposed to living in the city which separated one from it.

Summary of findings on EL in EcoSchools and non-EcoSchools. The students in EcoSchools (n = 481) scored higher in the EL than their counterpart in non-EcoSchools (n = 133). T-test statistics showed that students' scores in the former were significantly higher (63.56%) than their counterparts in non-EcoSchools (59.64%).

This observation may be attributed to the EcoSchools status of the schools since the statistical analysis pointed to a significant difference in score, which led to the conclusion that it was not likely due to coincidence. Hence, EE programs play a significant role in developing EL in individuals.

The above conclusion is congruent with other studies that assessed the effectiveness of EE programs for enhancing EL (e.g., Bogner, 1999; Culen & Mony, 2003; Dimopoulos et al., 2008; Hsu, 2004; Moody et al., 2005; Rovira, 2000; Roberts, 2008; Ruiz-Mallen et al., 2009; Walsh-Daneshmandi & MacLachlan, 2006; Wang, 2009) The findings in the aforementioned research showed that there were significant improvements in one or more EL components as a result of students being exposed to an EE program.

Summary of EL in gold/silver/non certified EcoSchools and non-EcoSchools. Students in silver certified EcoSchools (n = 281) had a mean score of 64.92% while mean average for gold certified schools (n = 175) and non-EcoSchools (n = 125) were 61.36% and 59.64% respectively (see Figure 7.2 for mean scores of groups).

The gold and the non-EcoSchools scores were not statistically different which implied that students in gold certified schools were not likely to score higher in an EL test than students in schools without EL programs. Interestingly, students attending silver

certified schools scored significantly higher than their counterpart in both the gold and non-EcoSchools.

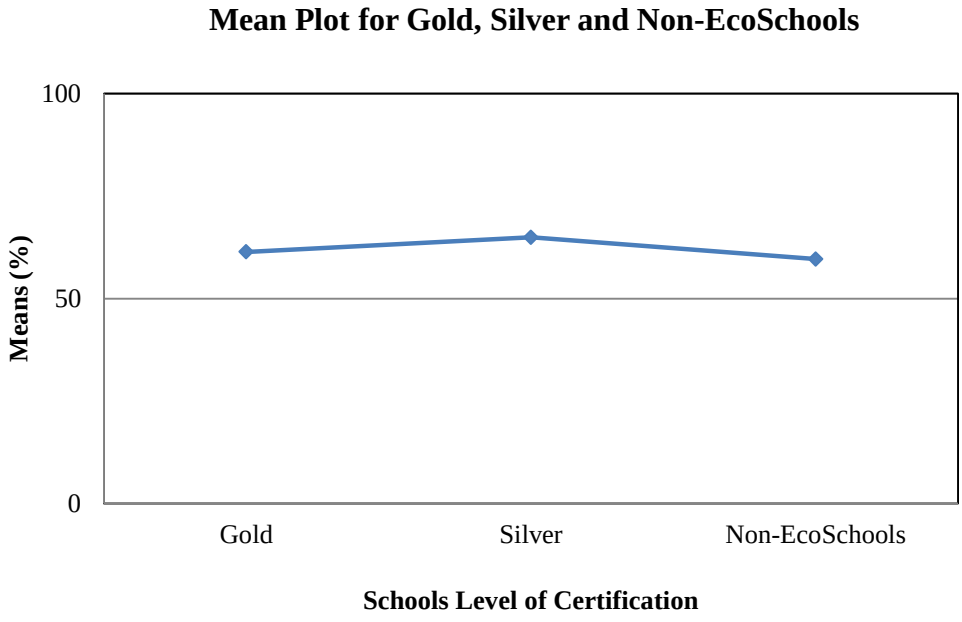

Figure 7.2. Mean scores for gold, silver and non-Ecoschools.

The observation led me to conclude that the certification level does not influence students' EL. Rather; EL may be influenced by the input made by the participating teachers and the eco-club. Dedicated teachers, according to the interviewed principal, and eco-clubs make the difference in the effect the program have on students EL. The effect of the eco-clubs was evidenced in the average score posted by students in clubs—72.58%, which was 4.18% higher than the nearest group of students in School 7.

Summary of students' EL levels using Ontario Ministry of Education grading system. The Ontario Ministry of Education grading system was used to categorise students' EL scores. Score distributions grouped by levels are illustrated in Figure 7.3. From the graph, 33% of the students were at level 1 or lower, while 36% were at level 2. The rest of the students, 29.3%, were on level 3 or higher. So, only about a third of the

students are deemed as having met the provincial success standard while 70.6% of the students were below the provincial standards.

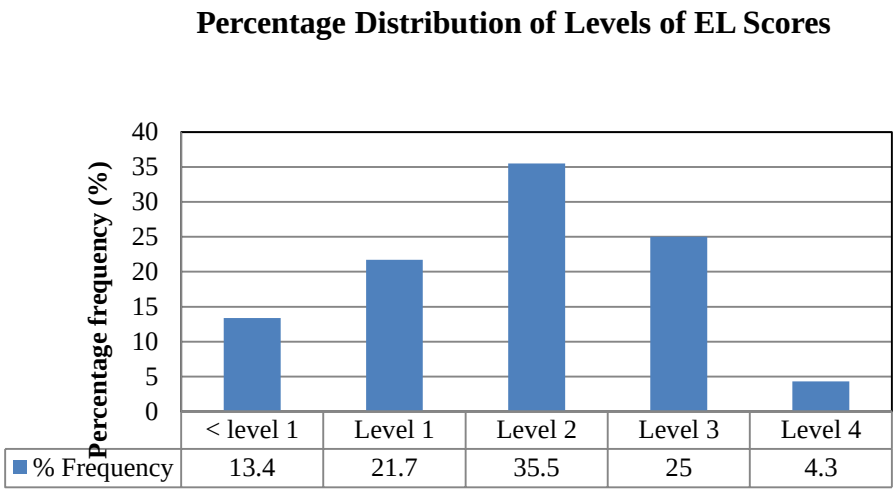

Figure 7.3. Distribution of students EL levels.

Summary of students' EL using Roth's continuum. From Figure 7.4, 16.9% of the students surveyed were approaching nominal literacy while 41.8% of these students were nominally literate. Figure 7.13 showed that 34.2% of the students surveyed were approaching functional literacy, while 5.6% were functionally literate. Finally, 1% of the students surveyed were approaching operational literacy, and 0.5% was operationally literate.

The mean EL score was 62.71%. Therefore, I conclude that on the average, students surveyed were approaching function literacy and have grown slightly beyond nominal EL based on Roth's continuum classification. Based on this mean score, the students are considered conversant with the basic knowledge of the component of living and non-living things in the ecosystem, the basics and nature of human interactions, and the fundamental components of the societal systems. This average score also leads me to conclude that students are capable of providing basic examples of the receding principles.

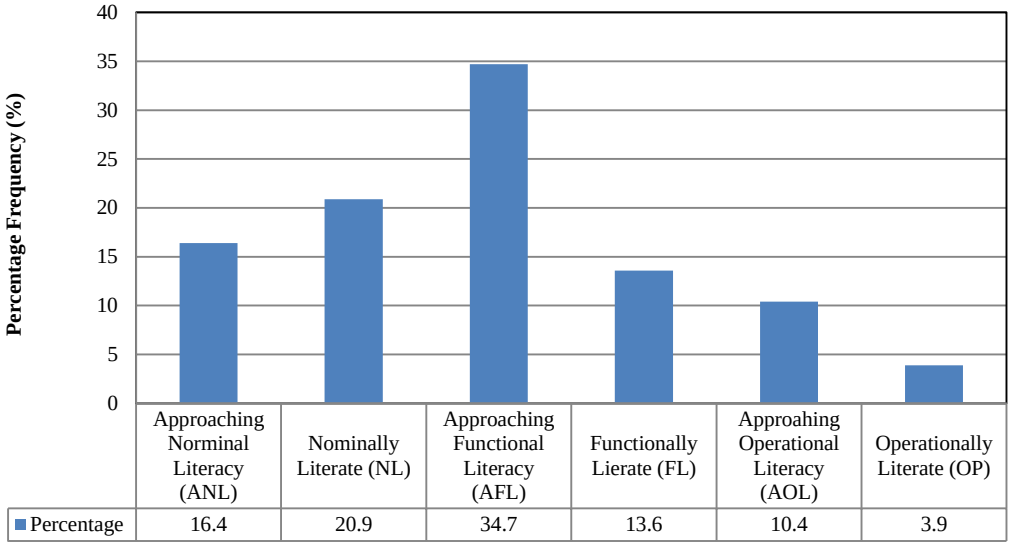

Figure 7.4. Students' EL summarised by Roth's continuum.

Students can also display affective basic sensitivity and empathy for the beauty of both nature and society and perception of the simple points of conflict between nature and society. Their skills to proffer solutions to environmental issues are emerging. They can identify and define basic environmental problems, recognise issues surrounding a problem and proffer some solution to the problem. Finally, these students can demonstrate some coping behaviour for environmental issues.

In addition to the above characteristics, the students are approaching developmental stages of environmental knowledge to display a wider knowledge and understanding of nature and the key interactions between human and the natural systems. In terms of environmental awareness, students are approaching the stage where they can show awareness and concern towards the negative interactions between human and social systems as it relates to an environmental issue (on at least one or more issues).

They are beginning to acquire the skills to analyze, synthesize, and evaluate information about issues using various primary and secondary sources of information and ideas. They are also beginning to assess a few problems or issues based on correct evidence, their personal values, and environmental ethics. Finally, students are approaching the stage where they are able to communicate their judgments and feelings to others when it comes to analysing an environmental issue.

The vision for EE in Ontario is that the "Ontario education system will prepare students with the knowledge, skills, perspectives, and practices they need to be environmental responsible citizens" (Working Group on Environmental Education, 2007, p. 4). To function at this level, high school students (especially Grades 12 students) have to show EL at an operationally literate level or meet the Ontario provincial standard of 70% achievement. Currently, majority of Grades 11 and 12 (almost 70%) students are below this standard, suggesting that there is still work to be done in the area of EE.

Research Findings on the Visibility of the EcoSchools Program

Visibility is the quality or a state of being noticed. For a program like the EcoSchools that was designed as a school wide initiative, its visibility may create greater level of environmental consciousness in students. This in turn could heighten awareness levels and result to students embracing and practicing the principles of EE.

The EcoSchools Questionnaire was used to gather data on how noticeable and visible the students find the EcoSchool. Students had to answer questions that showed evidence of their awareness of the program. They also had to report on things related to the EcoSchools they observed in their schools. The combination of awareness and prominence items (see Appendix B, questions 10-25) was used to determine the visibility of the EcoSchools program in the participating schools.

The EcoSchools visibility scores were analysed and converted to percentages. Scores of visibility for both the gold and silver certified schools were not very impressive (see Table 4.25 in Chapter 4). Overall, more than 73% of the students' scores put their school at a visibility level of below 2.

Forty-eight percent of the students' scored their schools' EcoSchool visibility at less than a level 1. From this score, it can be inferred that the EcoSchools program was almost invisible or had very limited prominence since almost 75% of the students' population in the schools were not aware of the program or knowledgeable of what it entailed.

In addition, it also meant that students had very limited knowledge of the following: what the red or blue recycle boxes were supposed to contain; common practices recommended by the EcoSchools program (like GOOS paper system); what their school did to conserve energy (e.g., switching off lights and motion sensor switches); and recommended good environmental behaviour. The visibility scores also meant that a greater percentage of the students rarely heard their teachers talk about the EcoSchools program, and the talk was limited to geography or science classes occasionally.

Overall, the visibility of the EcoSchools in schools could be improved. It may be pertinent to call on the eco-team to put in more time to bolster the visibility of the program. However, the problem is that more demands will be place on the few that are currently participating in the EcoSchool.

These demands could present a problem since one of the factors the teachers reported in their interview as hindering their commitment level to the EcoSchools program was time. Several of the teachers expressed the time factor as a limitation; as

they had to commit to their teaching as well as add EcoSchools co-ordinating to their repertoire.

From the interview, teachers believed that if they could put in more time, the program would enjoy more visibility. For example, T9 stated: "I wished I had more time to commit to improving the program." T2 agreed with T9 by saying that time constraints, over-commitment and limited help from other sponsoring teacher reduced her productivity with the EcoSchools program. While others (for example T2) stated "time factor to organise and commit to regular meetings; [with] so many other activities for example, work schedules, sports, clubs, and transportation factor [taking precedence]" made it difficult to fully commit to the EcoSchools program.

Lieberman (2013) in a study on environmental based education advised that schools that were intent on establishing a program needed to invest time. Time that can be used to inform the school community and create action plan needed for education.

However, majority of the schools in this study have a thirty minutes meeting once a week or less (as reported by various EcoSchools teacher co-ordinators). The time allocation is not enough to create the effectiveness that a program like the EcoSchools was designed to have.

Making the EcoSchools program more visible: Coordinating teachers' perspective. Several of the teachers agreed that the EcoSchools program could be more effective and visible, if some key components were changed. They suggested various changes and improvements like: increasing the manpower required for the running of the program; providing time release for teachers; and getting more teachers on board by offering them professional development on the EcoSchools program.

In order to achieve a greater awareness of EcoSchools among students, teachers and their eco-team will need support in putting extra effort and improving the following: establishing and organising a functional eco-board that would display attention catching environmental posters/projects; schools yard greening; labelled recycling bins; and visible cues to encourage good environmental behaviour.

Research Findings on Students' Awareness of the EcoSchools Program

EcoSchools awareness scores were converted to levels, 0 to 4—extremely low to an excellent level of awareness (see Table 4.16). From Table 4.17, 31.5% of the students had an extremely low or limited level of awareness of the EcoSchools program, 10.7% had a low level of awareness, 24.9% had a fair or moderate level of awareness, 12.6% had a good level of awareness and finally, 20.3% had an excellent level of awareness. About 67.1% of the students had awareness level of 2 (fair level of awareness) or lower while 32.9% of the students had an awareness level of 3 or greater. The target would be to have majority of the students (at least 51%) have EcoSchool awareness of level 3 or higher (good to excellent awareness levels).

Test statistics determined that students' level of awareness of the EcoSchools program varied significantly with the schools' level of certification. Figure 7.5 shows the frequency graph comparing students' awareness level in gold and silver certified EcoSchools.

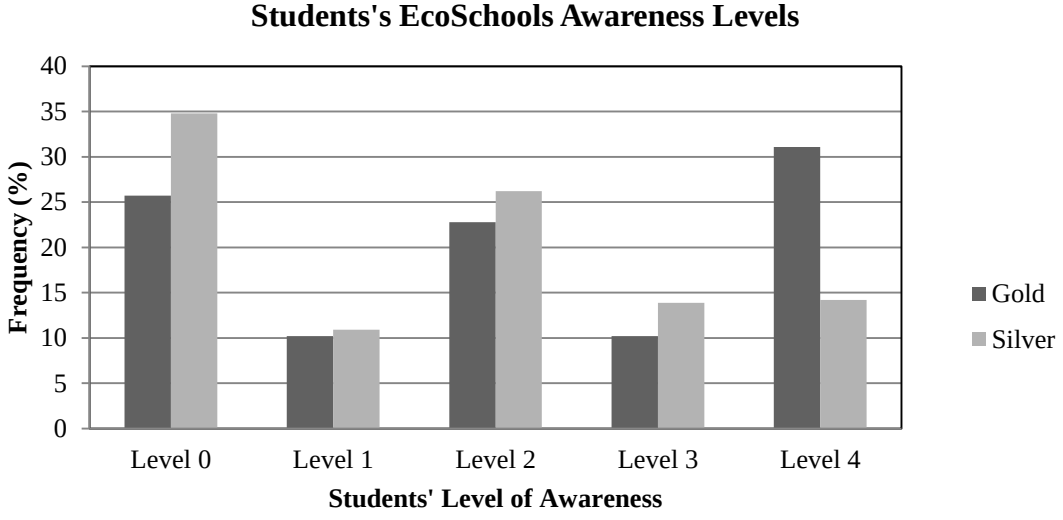

Figure 7.5. Comparison of students' level of awareness in gold and silver schools

In order to determine if there was a relationship between schools' level of certification and the students' level of awareness, a Pearson correlation test was conducted. The test determined that there was a relationship between schools EcoSchools' level and students awareness of the EcoSchools program. The relationship was not very strong. In other words, students in schools with EcoSchools gold level certification were somewhat more aware of their school as EcoSchools. The implication of the observation is that higher level of EcoSchools certification does translate to slightly higher level of students' awareness of the program.

Research Findings on Students' Sources of Environmental Knowledge

Seven sources of environmental knowledge (television, school subjects, EcoSchools' club, books, web/Internet. friends, and others), were presented as options to students in order to determine their main source of knowledge. Weighted average test results indicated that students rated school subjects as their main source of environmental knowledge. The ranking of the seven sources of environmental knowledge is displayed in Figure 7.6.

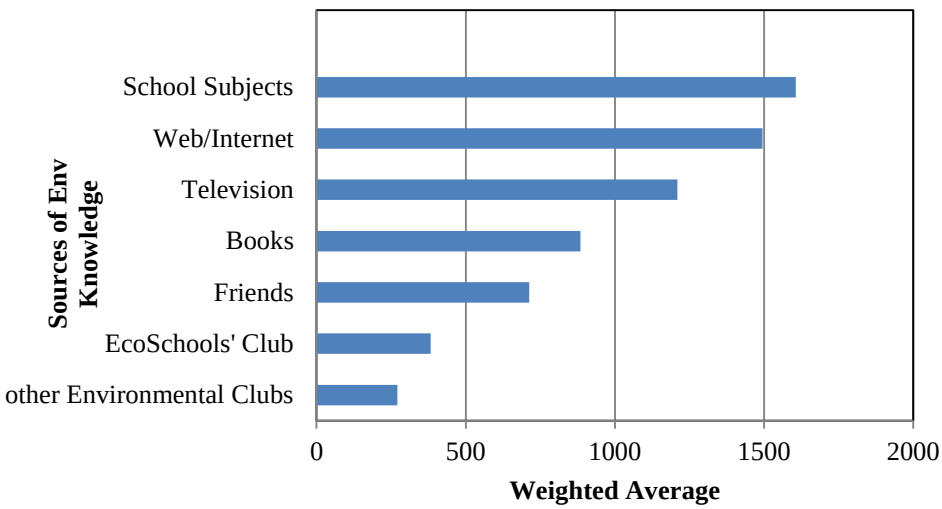

Figure 7.6. Weighted average and ranking of sources of environmental knowledge

Implication of findings on students' source of Environmental knowledge. The EcoSchools program aims at helping students develop ecological literacy (Ontario EcoSchools, n.d.a). One aspect of ecological literacy is knowledge. Hence, it would be pertinent to expect the program to be a source of environmental knowledge for students and the school community.

The result indicated that the EcoSchools program or clubs were not the main source of students' environmental Knowledge. Students indicated that school subjects were their main source of environmental knowledge. The subjects most often cited as main source were geography, followed by science and then environmental science. Other subjects that received mention were green industry, construction, math and computer science.

The second major source of environmental knowledge was the Internet, and rounding up the top three was television. Students listed the Discovery Channel as the TV program where they got their most TV based environmental knowledge. It should be

noted that Discovery Channel is not a specific program. It was not clear why channel was the main choice. National Geographic was ranked second in frequency as the TV program that provided environmental knowledge for students. Other programs mentioned included; Animal Planet, The Nature of Things, CSI Miami, Earth, news/documentaries, Cosmos, Beno, PBS and CBC.

The EcoSchools-club and other environmental clubs were ranked 6th and 7th as important source of knowledge. The inference I make from this observation is that most students did not consider the EcoSchools or eco-clubs as a significant source of their environment knowledge.

Although the prospect of the EcoSchools being a source of environmental knowledge might not look very promising, there were students that listed it as their main source of environmental knowledge. These students were also members of the EcoSchools club. Therefore, the issue here may not lie solely in the EcoSchools not providing knowledge, but in the fact that the information the program provided were only accessible to the few students that participated.

Hence, to help the program become a major source of knowledge, students' participation will have to increase and teacher co-ordinators will have to develop a way to effectively disseminate EcoSchools material to the other members of the school community that are not directly involved with the program.

Findings on Teachers' and Students' Participation in the EcoSchools Program

The EcoSchools main aim is helping students develop ecological literacy and engage in practices that help them become environmentally responsible citizens through engaging them in EE and environmental responsible actions (Ontario EcoSchools, n.d.).

Learning through participation (social learning situation) is the central theme. Hence, for learning to occur in this situation, the students have to be actively involved. Therefore, if the students the program was designed for are not involved in the whole process, the aim of the program is defeated.

From analysing the frequency of students' participation in the EcoSchools, the results revealed that only 11.8% of the students have ever participated in the EcoSchools program (74 out of 609 students). The participation could have been from either when they were in elementary school or their current school. Among the 79% (n = 74) that indicated they participated in an eco-club, less than 50% of them do so weekly, while 28% of them rarely participated. The other 30% either participated once or twice a month. These numbers are relatively low for a program that is designed to thrive on students' participation.

The EcoSchools' Co-ordinator mentioned his concern on the low level of participation and the success of the program in secondary school when compared to the elementary schools. He stated that there was "a sense of greater passion in the elementary school than the secondary schools." When urged to speculate on probable reasons for this, he stated that "the mind in elementary school is able to be nurtured more and get excited easily on new things and new learning," while the "Secondary school students have seen it in their elementary school and they may not have the same passion." But, he stated that he sees on the secondary side that "people are starting to become more of a leader; more involved around environmental issues, picking it up more seriously. It may not be the same number, might have a lesser number …but the individuals that are involved might have a deeper passion." In order words, there may be reduced level of participation, but

the students that were part of this program were very dedicated to the goals they set to achieve as environmental leaders in their schools.

Currently, the level of participation of both students and teachers is extremely low. For the EcoSchools program to develop further, an efficient and effective way of involving a greater number of students will have to be established.

Findings on Teachers' Use of the EcoSchools Curriculum Resources

The EcoSchools program provides several relevant curriculum resources that teachers can use in their classroom for teaching. However, the onus now lies on the teacher to go the EcoSchools website and find the material that is relevant to their subject area.

From the EcoSchools teacher co-ordinators surveyed, only 50% of them said they had used some of the materials provided for teaching in their classroom, even though most of them were aware that these resources existed. The reasons they gave for non or sparing use of the materials were time, relevance, and lack of consideration.

The overarching question is, if the teachers are not using the curriculum material provided by the program, what are they using to develop EL in students? What sequential instructional strategies or activities are they using instead to establish learning in EL? Other than the EcoSchools teachers, there was no evidence that other teachers were making use of the materials provided by the EcoSchools program.

Until these questions are answered effectively and problems remedied where necessary, the EcoSchools curriculum resource may not necessarily be enhancing EL as it's meant to do and at best, may be an inactive resource that is not very functional.

Findings on the Changes the EcoSchools Program Has Brought to Schools

It may be easy to judge the EcoSchools program for its lack of success it is expected to have, but whatever the shortcomings of the EcoSchools program might be, several of the teacher co-ordinators believed it has brought very visible changes to several areas around the school community.

EcoSchools' teacher co-ordinators identified eight different areas where there has been noticeable change as a result of the EcoSchools program. These areas included: recycling, waste reduction, re-useable bottles, energy use, students' efforts, school yard greening, environmental awareness, available resources to take on larger eco-friendly initiatives, and funding.

In effect, although the EcoSchools might not currently be having the envisioned effects on students EL, co-ordinating teachers agreed that there were several aspects they found useful, impressive and relevant. Teachers highlighted students' engagement (very negligible in terms of number of participants, but of great quality for the participating few), EcoSchools annual training, waste and energy audit, best practices and outdoor education as some of the most impressive aspects of the EcoSchools program.

Research Findings and its Implication for Theory and Instructions

The EcoSchools program is designed to be integrated and not really a stand-alone course of study. Puk and Behm (2003) argued that this format of delivery of EE programs (infusion with other subjects) often lacked the "sequential order for developing ecological literacy within individual courses and from grade to grade" (p. 227). Although students' EL is impacted positively when students participated in an EE program, the programs are usually deliberate, sequential and goal oriented (Lieberman, 2013).

A learner, who is participating in a situation where the right conditions for learning are invoked, will likely experience learning in these the five categories: intellectual skills, verbal information, cognitive strategies, motor skills, and attitudes. However, for learning to be effective and have outcomes in the domains, teaching has to be purposeful following the patterns of the instructional events in an appropriate learning environment (Driscoll, 2005).

The sequential pattern of instruction, prescribed in Gagne events of instruction (Driscoll, 2005, p. 349) is what the EcoSchools program currently lacks. There is no specific structure or recommended mode of instruction (in terms of getting the information across to all the students in the school) for all the wealth of material and activities the program provides. At best, the process of information dissemination in the EcoSchools program is informal; lacking in structure and instructional strategies that will elicit purposeful learning and improve EL. Participation is voluntary and only beneficial to the very few students that seize the opportunity.

To move forward, the EcoSchools program needs to inculcate a better instructional structure and strategies for achieving its goals and set up an assessment criteria that will be an addition to the certification standards and process. The instructional strategies will have to be inclusive of all students and not limited to the few students that deems it fit to participate.

Recommendations on How to Make the EcoSchools Program More Effective: From the EcoSchools Teacher Co-ordinators' Perspective

To make the EcoSchools more effective, teachers provided a list of changes that could improve the success of the program. The changes suggested by teachers were

centered on the following areas: infrastructure, administrative, teachers, students, and the program.

Infrastructural changes. T1 noted that their school is a "building with old traditional utilities, i.e. lead pipes" and to become more environmentally friendly "it would require financial input" to change the lighting and water pipes. T1 believed that in order to communicate good environmental practice to the students, school infrastructure has to be exemplary in terms of its' environmental efficiency

Administrative. T2 advocated for a reduction in the number of ministry/board initiatives in order to focus more on 'necessary' initiatives like the EcoSchools program while T1 suggested more administrative backing in activities and initiatives.

Teacher. The teachers believed that the manpower required for planning a successful EcoSchools' program was insufficient. T6 suggested getting other teachers involved and providing specific duty for all participating teachers. Similar to T6's suggestion, T3 and T10 agreed that other teachers' involvement would help improve the program. T10 stated that "more teacher help [is needed in] facilitating [the] EcoSchools program."

T6 proposed that since the planning and overseeing of the whole program required a major time investment and even summer time input when the maintenance of the outdoor greening was taken into consideration, specific time allotment and/or release time to fulfil their duty should be provided for teachers involved with the program.

Students. T5 suggested getting the Grades 9 and 10 students on board with the program, while T7 suggested that for a more effective EcoSchools program, "more consistency [is required] when it comes to participation among the students body."

Program. Teacher 09 commented on the overwhelming amount of paperwork that must be completed for the certification process. They said, "it would be nice to receive outside support/guidance as to what we can do." On the same line of receiving outside support, T8 advised that the program should "stop doing everything on-line" by reducing online activities and increasing human interaction.

Conclusion: Implications of Findings for Practice and Recommendation

The vision for EE in Ontario is to equip students with the knowledge, skills, perspectives, and practices needed to be environmentally responsible citizen (Report of the Working Group on Environmental Education, 2007, p. 4). However, EL in the secondary school students surveyed is relatively very low and the realization of the Ontario's EE vision for the students is not being met.

Also, students in the EcoSchools performed better than students in the non-EcoSchools. The EL scores were even more significantly higher when the scores of students in the EcoSchools clubs were isolated. This observation is an indication that the EcoSchools program has the capacity to impact and improve students' EL if well implemented. However, the onus falls on the developers and teachers to implement the program effectively in order to achieve the goals of EE. Conversely, teachers expressed their frustration in finding the time to fully implement and function in their capacity as an EcoSchools co-ordinator at the same time fulfill their primary role in the classroom.

Teachers agree that it would be beneficial if they were given more release time, and/or paid summer so they can come in and prepare for the year ahead without having to worry about their individual classrooms during the school year. This extra time they say, will also help them work with students over the summer to boost the implementation of the outdoor component of the EcoSchools program.

Furthermore, EE is meant for all. Currently, the participation of students in the EcoSchools is extremely low. Only the students that voluntarily join the EcoSchools club benefit mostly from the knowledge and content of the program. Effort should be made to include all students in EE/EcoSchools programs.

Also, most of the co-ordinators interviewed indicated that they rarely or never used the curriculum materials provided by the program. Teachers cited time, material irrelevance and lack of consideration as factors. The reasons cited by the teacher as limitation is also echoed by Galloro's findings. As a result, Galloro recommended that all EE programs and initiative should be a total package. In other words, it should be ready to use with complete instructions to reduce and eliminate the time it takes for teachers to gather resources, prepare, sift through available information, and finally tie it all together into the curriculum to make sense (Galloro, 2002, p. 21).

One characteristic of an effective EE program discussed in the literature review is completeness. An EE program and its package and resources should be ready to use with very minimal preparation. A complete package will alleviate the time constraint teachers cited as a factor limiting their use of the materials and finding its appropriateness in their subject area and maybe become more useable for many other teachers. Hence, the EcoSchools program designer should consider developing and providing a ready-to-use activity booklet, categorized into specific subjects areas (for high school) so teachers employ in their instructions when necessary.

Currently, only the EcoSchools teachers are afforded the training needed to effectively implement the initiative. The participating teachers have lauded the training as one of the positives in the program. However, the EcoSchools program is a school-wide program, as is the vision for EE in Ontario schools. If the school wide approach is to be

successful, then the training for it implementation should be extended to other teachers (Working Group on Environmental Education, 2007). Furthermore, efforts should be made to include pre-service teachers in EE training to prepare and get them ready for when they would assume the responsibility of full time teachers in secondary schools.

The majority of the students in the EcoSchools were not aware that their school was part of the program. The observation is indicative of lack of promotion of the program which could be attributed to teachers lacking time to fully function as an EcoSchools teacher. To remedy the low level of awareness, the school board should consider releasing a class period to give teachers the time needed to function effectively as co-ordinators. Also, schools should make a conscious effort to collaborate with teachers by encouraging and prompting them to display students' in-class work related to EE. Eye-catching displays and outstanding EE activities should be used to drum up support, increase visibility and awareness of the EcoSchools program.

Presently, the EcoSchools program is not a very significant source of environmental knowledge for students in secondary schools. In the EcoSchools objectives statement, one of the aims is to help school boards promote EL for all students (Ontario EcoSchools, 2010, p. 2). For EL to be promoted, the EcoSchools program will have to become a main source of environmental knowledge.

The EcoSchools will also need to become a major influence on students' environmental attitude and behaviour. The key to achieving this is the EcoSchools program becoming very prominent and utilising every avenue, like their display boards, for disseminating eye-catching EcoSchools and EE information for students on a regular basis.

Finally, the Ontario Ministry of Education strategies for achieving the goals of EE in Ontario schools are to:

- Increase student knowledge and develop skills and perspectives that foster environmental stewardship,
- Model and teach EE through an integrated approach that fosters collaboration in the development of resources and activities,
- Build students capacity to take action on environmental issues,
- Provide leadership support to enhance students' engagement and community involvement,
- Increase the extent to which EE is integrated into school boards policies, procedures, and strategic plans,
- Enhance the integration of environmentally responsible practices into the management of resources, operations and facilities (Ontario Ministry of Education, 2009).

The EcoSchools program is still at its infancy in fulfilling the first four goals of EE. The EcoSchools program has to be deliberate, sequential and result/outcome oriented in its attempt to cultivate and build EL in students.

Parting Remarks

The process of assessing EL as it pertains to a program that is already in place is very complex and presents numerous challenges. EL assessment in Ontario is fairly new and this study is among the first of its kind. The lack of baseline information on students' EL before the advent of the EcoSchools program makes it difficult to conclude with certainty that the significant difference observed in the EL scores of students in Eco and non-EcoSchools is attributable to the program.

EL is not based solely on ecological/environmental knowledge, but also on reported environmental behaviour and attitude (which might be influenced by ones

immediate surrounding). Hence, the examination of the visibility of the EcoSchools based on students' awareness of some common EcoSchools practices and noticeability the EcoSchools' paraphernalia.

Also, several facets of EL were examined in order to provide more insight on the variables that might be influencing it, for example, school locations, EcoSchools as a source of environmental knowledge and participation in an eco-club.

The research central question was whether the EcoSchool program was having a significant influence on students' EL. While the EcoSchools had a significantly higher average EL scores than the non-EcoSchools, the overall average scores were not very impressive and were both below provincial standard of achievement (<70%). However, the average EL scores of the eco-club, which met the provincial standard, gave the EcoSchools program greater credibility for EL acquisition.

While it is interesting to note that students in the eco-club were positively impacted and have higher EL scores, the incredibly low participation of students in the program created concern in terms of the program's effectiveness for EL acquisition for non-participants.

Another area of concern was the visibility of the EcoSchools program. Based on how much the students reported noticing some of the EcoSchools' paraphernalia; 75% of the students were not aware of the EcoSchools program in their schools, neither were they knowledgeable of what it entailed.

Hence, Schools have to work on improving the visibility of the EcoSchool program within the community and mandating participation for all students. Currently, less than 15% of the students surveyed participate in the program. The EcoSchools program on their part may need to include an EL assessment component (since EL is one

of their goals) and on a more policy level, the school board may have to allocate the co-ordinating teachers extra time (a subject period) to dedicate to EE in order to improve visibility.

Limitation of Study

1. The sampling method was convenient and non-probabilistic. The spread of the sample also was limited to one school board. Therefore, caution should be exercised in generalising the findings of this research. Rather, it may be more applicable to the sampled population. As the administrator interviewed aptly stated, the success of a program and its impact is dependent on the teacher that champions it and also on each individual school and the goals they stressed and promoted.
2. This research relied heavily on instruments (MSELS, EcoSchools Questionnaire, and Teachers' Interview) to gather data. The efficacy of the data is very reliant on the responses the participants gave. Therefore, this research assumed that the participants responded to the questions in a truthful way (they were also encouraged to be honest since research was confidential). It should be noted that it may be possible that participants supplied answers that they felt were the expected ones and not necessarily the truthful one.
3. The students complained about the length of the MSELS and the fact that there were long readings passages at the later sections (there were five passages with three or four short paragraphs). Scores decreased in the MSELS with each section. Hence, the length of the MSELS and EcoSchools Questionnaire might have affected the students' scores negatively.

4. The MSELS was designed to assess EL among middle schools (Grades 6-8). The environmental knowledge component might have been too easy for the high school students.
5. The EcoSchools Questionnaire and the EcoSchools Teachers' interview question were designed by the researcher for data collection. Although efforts were made to ensure that the instruments were reliable and valid, the data collected is only as good as the instruments that were used to collect them.
6. Also, as a result of the low number of participants and homogeneity of data source (only one school board), it is suggested that generalisation from the findings should be done cautiously.
7. The MSELS used for assessing EL was designed for American middle school student. Hence, there may be bias in the instrument against Canadian students (e.g., students did not know the meaning of Sierra club in the Issue Identification, Issues Analysis and Action Planning section).

Areas for Further Research

This study was conceptualized from my experience as a teacher and my desire to become part of the EcoSchools program. As a geography teacher, my training afforded me the resources of being well equipped to handle EE and EL. An interesting area for future research would be one that could determine the EL of secondary school teachers and their readiness to implement the Ontario's Ministry of Education mandate for EE.

The full curriculum content and materials in the EcoSchools program were not explored. Hence, a research that could explore the relevance and efficacy of these materials for EL acquisition across subjects' areas would be welcomed.

After being in the field collecting data and talking to secondary school teachers, several of them confirmed that the EcoSchools recycling initiatives changed their environmental behaviour in terms of their recycling habit. Another area for further research would be to examine teachers' and students' perception on how the EcoSchools program has influenced their environmental behaviours.

Finally, rather than using an EL instrument, another study may seek to use focus groups (random and not selected from the eco-club) directed towards finding how the EcoSchools program is impacting students (in terms of knowledge, attitude, behaviour and environmental skills) in their schools.

REFERENCES

Alp, E., Ertepinar, H., Tekkaya, C., & Yilmaz, A. (2006). A statistical analysis of children's environmental knowledge and attitudes in Turkey. *International Research in Geographical and Environmental Education, 15*(3), 210-223. doi: 10.2167/irgee193.0

Auer, M. R. (2008). Sensory perception rationalism and outdoor environmental education. *International Research in Geographical and Environmental Education, 17(*1), 6-12. doi:10.2167/irgee225.0

Baker, K. (1991). The greening of our schools. *IPA Review, 44*(2).

Berelson, B. (1952). *Content analysis in communication research.* New York: Hafner.

Berg, B. L. (2001). *Qualitative research methods for the social sciences* (4th ed). Boston: Allyn and Bacon.

Bogner, F. X. (1999). Empirical evaluation of an educational conservation programme introduced in Swiss secondary schools. *International Journal of Science Education, 21*(11), 1169-1185.

Botkin, D. B. and Keller, E. A. (2003). *Environmental science: Earth as a living planet.* (4th ed). Danver, MA: John Willey.

Brennan, S. & Withgott, J. (2005). *Essential environment: The science behind the stories.* San Franscisco, CA: Pearson and Benjamin Cummings.

Canadian Environmental Grantmakers' Network. (2006). *Environmental education in Canada: An overview for grantmakers.* Toronto, ON: Author. Retrieved from http://www.walkingthetalk.bc.ca/files/EEBrief_Eng.pdf

Chernos, S., (2007). Students go outdoors for education. *Education Today, 19*(3), 14-17.

Clark, C. (2010, September 30). Arthur Public School earns gold for going green. Arthur Enterprise News. Retrieved from http://www.wellingtonnorth.com/

Chu, H., Lee, E. A., Ko, H. E., Dong, H. S., Lee, M. N., Min, B. M., & Kang, K, H. (2007). Korean year 3 children's environmental literacy: A prerequisite for a Korean environmental education curriculum. *International Journal of Science Education, 29*(6), 731-746.

Cinquetti, H. C. S. & de Carvalho, M. L. (2007). Teaching and learning about solid waste: Aspects of content knowledge. *Environmental Education Research, 13*(5), 565-577. doi: 10.1080/13504620701712449

Creswell, J. W. (2008). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (3th ed). Boston: Pearson

Creswell, J.W. (2014*). Research design: Qualitative, quantitative and mixed methods approaches.* Los Angeles: Sage.

Culen, G.R. (2005). The status of environmental education with respect to the goal of responsible citizenship behavior. In H. R. Hungerford, W.J. Bluhm, T.L. Volk & J. M. Ramsey (Eds.), *Essential readings in environmental education,* (3ed. pp. 37-45). Champaign, IL: Stipe Publishing.

Culen, G.R. & Mony, P.R.S. (2003) Assessing environmental literacy in a nonformal youth program. *Journal of Environmental Education, 34*(4), 26-28.

Cutter-Mackenzie, A., & Smith, R. (2003). Ecological literacy: the 'missing paradigm' in environmental education (part one). *Environmental Education Research, 9*(4), 497-524.

Creative Research System. (n.d.). *Sample size calculator.* Retrieved from

http://www.surveysystem.com/sscalc.htm

Dillon, J. & Wals A. E. J. (2006). On the dangers of blurring methods, methodologies and ideologies in environmental education research. *Environmental Education Research, 12*(3-4), 549-558. Doi:10.1080/13504620600799315

Dimopoulos, D., Parakevvopoulos, S., & Pantic, J.D. (2008). The cognitive and attitudinal effects of a conservation educational module on elementary school students. *Journal of Environmental Education, 39*(3), 47-61.

Disinger, J. F. (1997) Environment in the K-12 curriculum: An overview. In R.J. Wilke (Ed.), *Environmental education teacher resource handbook* (pp. 23-43). Thousand Oaks, California: Corwin Press.

Disinger, J. F. (2005). Environmental education's definition problem. In H.R. Hungerford, W.J. Bluhm, T. L. Volk & J. M. Ramsey (Eds.), *Essential readings in environmental education,* (3ed. pp. 17-28). Champaign, IL: Stipe.

Driscoll, M. P. (2005). *Psychology of learning for instruction.* 3ed. Boston: Pearson

Dyment, J. E. (2005a). *Gaining ground: The power and potential of school ground greening in the Toronto District School Board.* Evergreen Foundation: Toronto, CA. Retrieved from http://www.evergreen.ca/en/lg/lg-resources.html

Dyment, J. E. (2005b). Green school grounds as sites for outdoor learning: Barriers and opportunities. *International Research in Geographical and Environmental Education, 14*(1), 28-45.

Eames, C., Cowie, B., & Bolstad, R. (2008). An evaluation of characteristics of environmental education practice in New Zealand schools. *Environmental Education Research, 14*(1), 35-52.

EarthCARE™ – An Environmental Education Partnership (n.d.). *About EarthCARE*. Retrieved from http://www.earthcarecanada.com/About_EarthCARE/default.asp

EarthCARE Program, (2004). Environmental learning for Ottawa-Carleton students (EarthCARE Program). *Education Today, 16*(1), 10.

Fawcett, L. (2009). Environmental education in Ontario: To be or not to be. *Our Schools, Our Selves, 19*(1), 103-107.

Firth, M. (2010, November 18). Eco-clubs make the grade with Green. *The Tribune*. Retrieved from http://www.wellandtribune.ca/ArticleDisplay.aspx?e=2851755

Freedman, B. (2010). *Environmental science: A Canadian perspective* (5ed). Pearson Toronto: Canada.

Foster, A., & Linney G. (2007). *Reconnecting children through outdoor education: A research summary*. Toronto: The Council of Outdoor Education

Gagne, R. M. (1970). *The conditions of learning* (2ed). New York: Holt, Rinehart and Winston, Inc.

Gagne, R. M., Wager, W. W., Golas, K. C., and Keller, J.M (2005). *Principles of instructional design. 5ed.* Belmont: Thomson/Wadsworth.

Galloro, J. (2002). Human activity and the environment: A vital resources for teachers and students. *School Libraries in Canada, 22*(1), 21-22.

George, D., & Mallery, P. (2010). *SPSS for Windows: Step by Step – A Simple Study Guide and Reference. 17.0 Update.* Boston, MA: Allyn & Bacon.

Greig, J. (2002). The watershed project (Curtis Creek, Peterborough). *Teach: Education for Today and Tomorrow. 5*,13-18. Retrieved from http://www.teachmag.com/wp-content/uploads/2010/09/Teach-May-Jun-2002.pdf

Grippin, P. C., & Peters, S. C. (1984). Learning theory and learning outcomes: The connection. University press of America: Lanham.

Gropper, G. L. (1983). A behavioural approach to instructional prescription. In C. M. Reigeluth (Ed). *Instructional-design theories and models: An overview of Current status* (pp. 106-161). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Hart, P. (1996). Problematizing enquiring in environmental education: Issues of method in a study of teacher thinking and practice. *Canadian Journal of Environmental Education, 1*, 56-88.

Hammond, L., Austin, K., Orcutt, S., & Rosso, J. (2001). *How people learn: Introduction to learning theories.* Stanford University School of Education. Retrieved from http://web.stanford.edu/class/ed269/hplintrochapter.pdf.

Hart, P., & Nolan, K. (1999). A critical analysis of research in environmental education. *Studies in Science Education, 34*(1), 1-69.

Hastings & Prince Edward District School Board. (2010). *EarthCare:* 2009*/2010 Year-End Report for the Hastings & Prince Edward District School Board.* Retrieved fromhttp://earthcarecanada.com/Library/OCDSBreport09.pdf.

Higgs, A. L., & McMillan, V. M. (2006). Teaching through modeling: Four schools' experiences in sustainable education. *The Journal of Environmental Education, 38*(1), 39-53.

Hollis, M. (1999). *The philosophy of social science: An introduction.* Cambridge: Cambridge University Press.

Hollweg, K.S., Taylor, J. R., Bybee, R. W., Marcinkowski, T. J., McBeth, W. C., & Zoido, P. (2011). *Assessing environmental literacy: A proposed framework for the*

Programme for International Student Assessment (PISA) 2015. Retrieved for North American Association for Environmental Education website: http://www.naaee.net/sites/default/files/framework/frameworkPISA2015.pdf

Horowitz, F. D. (1987). *Exploring developmental theories: Toward a structural/behavioral Model of development.* Hillsdale, NJ: Lawrence Erlbaum.

Hungerford, H. (2002a). Environmental Educators. *Journal of Environmental Education, 33*(3), 5. Retrieved from Academic Search Complete database.

Hungerford, H. (2002b). Environmental educators. *Journal of Environmental Education, 33*(4), 4-9.

Hungerford, H., Peyton, R. B., & Wilke, R. J. (1980). Goals for curriculum development in environmental education. *Journal of Environmental Education, 11*(3), 42-47.

Hungerford, H. R., Volk, T. L., McBeth, W. C. & Bluhm, W. J. (2009). *Middle School Environmental Literacy Survey.* Carbondale, IL: Center for Instruction, Staff Development, and Evaluation.

Hsu, S. (2004). The effects of an environmental education program on responsible environmental behaviour and associated environmental literacy variables in Taiwanese college students. *Journal of Environmental Education, 35*(2), 37-48.

Hsu, S. & Roth, R. E. (1999). Predicting Taiwanese secondary teachers' responsible environmental behavior through environmental literacy variables. *Journal of Environmental Education, 30*(4), 11-19.

IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM.

International Centre for Educators' Learning Styles (n.d). *Robert Gagne's Five Categories of Learning Outcomes and the Nine Events of Instruction.* Retrieved from http://www.icels-educators-for-learning.ca/index.php?option=com_content&view=article&id=54&Itemid=73

Iozzi, L. (Ed.). (1984). *A summary of research in environmental education, 1971-1982. The second report of the National Commission on Environmental Education Research.* Monographs in environmental education and environmental studies, volume II. Columbus, OH: ERIC/SMEAC.

Johnson, B. J., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14-26.

Kyriazi, P., & Mavrikaki, E. (n.d.). Development of an instrument to measure environmental literacy of post –secondary greek students – pilot testing and preliminary results. *European Science Education Research Association.* Retrieved from http://www.esera.org/media/esera2013/Panagiota_Kyriazi_6Feb2014.pdf

Katz, W. B. (1998). The ABCs of environmental science. Rockville, MD: Government Institutes.

Kollmuss, A. & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to proenvironmental behavior? *Environmental Education Research, 8*(3), 239-260.

Krisppendorff, K. (2013). *Content analysis: An introduction to its methodology* (3rd ed). Los Angeles: Sage.

Lanigan, J. (1998). BASF Corporation's Rehabilitation of Fighting Island. In Tulen L.A., Hartig, J. H., Dolan, D. M., & Ciborowski, J. (Eds). *A binational conference on*

rehabilitating and conserving Detroit river habitats. Great Lakes Institute for Environmental Research and Citizens Environmental Alliance of Southwes Occasional Publication, 1. Windsor: ON. Retrieved from http://riccawu.mnsi.net/story9.html

Leeming, F., & Dwyer, W. (1995). Children's environmental attitude and knowledge scale: Construction and validation. *Journal of Environmental Education, 26*, 22-31.

Lidstone, J., & Stoltman, J. (2008). Research paradigms and reflections in geography and environmental education. *International Journal of Geographical and Environmental Education, 17*(3), 195-198. doi: 10.1080/10382040802367329

Lieberman, G. A. & Hoody, M.A. (1998). *Closing the achievement gap: Using the environmental as an integrating context for learning. State Environmental Education Roundtable*. Retrieved from http://www.magicoflandscapes.com/Research/Closing%20the%20Achievement%20Gap.pdf

Lieberman, G. A. (2013*). Education and the environment: Creating standards-based programs in schools and districts.* Massachusetts: Harvard Education Press.

Lin, E. (2002). Trend of environmental education in Canadian pre-service teacher education programs from 1979-1996. *Canadian Journal of Environmental Education 7*(1), 199-215.

Lin, E., & Qingmin, S. (2014). Exploring individual and school-related factors and environmental literacy: comparing U.S. and Canada using PISA 2006. *Internation Journal of Science and Mathematics Education. 12*, 73-97.

Lodico, M. G., Spaulding, D. T., & Voegtle, K. H. (2006). *Methods in educational*

Research: From theory to practice. San Francisco: Jossey-Bass.

Maloney, M.P., & Ward, M.P. (1973). Ecology: Let's hear from the people an objective scale for the measurement of ecological attitudes and knowledge. A revised scale for the measurement of ecological attitudes and knowledge. *American Psychologist, 28*(7), 583-586.

Maloney, M.P., Ward, M.P., & Braucht, G.N. (1975). A revised scale for the measurement of ecological attitudes and knowledge. *American Psychologist, 30*(7), 787-790.

Marcinkowski, T. (1997). Assessment in environmental education. In R. J. Wilke (ed.), *Environmental education teacher resource handbook: A practical guide for K-12 environmental education* (pp.143-197). Thousands Oak, California: Corwin Press.

Makki, M. H., AbD-El-Khalick, F., & Boujaoude, S. (2003). Lebanese secondary school students' environmental knowledge and attitude. *Environmental Education Research, 9*(1), 21-33.

Marshall, K. (1997). State-level curriculum guidelines: An analysis. In R. J. Wilke (Ed.), Environmental education teacher resource handbook (pp. 103-142). Thousand Oaks, California: Corwin Press.

McBeth, W.C. (1997). *An historical description of the development of an instrument to assess the environmental literacy of middle school students.* (Unpublished Doctoral dissertation, Southern Illinois University). Retrieved from http://proquest.umi.com.ezproxy.uwindsor.ca/pqdweb?RQT=500&pageName=diss_copyright.vtpl

McBeth, B., Hungerford, H., Marcinkowski, T., Volk, T., & Meyers, R. (2008). *National Environmental Literacy Assessment Project: Year 1, National Baseline Study of*

Middle Grades Students Final Research Report. Retrieved from http://www.epa.gov/education/pdf/MASTERNELA_Year1Report_081208_.pdf

McBeth, W. & Volk, T. L. (2010). The national environmental literacy project: A baseline study of middle grade students in United States. *The Journal of Environmental Education, 41*(1), 55-67. doi: 10.1080/0095890903210031

McMillan, J. H. & Schumacher, S. S. (1997). *Research in education: A conceptual introduction* (4th Ed). Longman: New York

Meredith, J., Cantrell, D., Conner, M., Evener, B., Hunn, D., & Spector, P. (2000). *Best practices for environmental education: Guiding success.* Environmental Education Council of Ohio. Retrieved from http://www.eeco-online.org/publications/pdfs/beeps.pdf

Meyers. R. (2009). 5th annual North American Association for Environmental Education's research symposium. *Journal of Education for Sustainable Development, 3*(1), 13-18.

Milfont, T. L., & Duckitt, J. (2010). The environmental attitudes inventory: A valid and reliable measure to assess the structure of environmental attitudes. *Journal of Environmental Psychology, 30,* 84-94.

Mony, P. R. S. (2002). *Assessing environmental literacy in Florida's 4-H environmental education program.* (Master's thesis). University of Florida, Gainesville, FL. Retrieved from etd.fcla.edu/UF/UFE1001169/mony_p.pdf

Moody, G., Alkaff, H., Garrison, D., & Golley, F. (2005). Assessing the environmental literacy of University of Georgia. *Journal of Environmental Education, 36*(4), 3-41.

Morgan, K. (2010, October 7). North Durham schools are eco-excellent. *The Scugog*

Standard. Retrieved from http://www.thescugogstandard.ca/news/2010/October2010/oct07-2010/north_durham_school-303.html

Morrone, M., Mancl, K., & Carr, K. (2001). Development of a metric to test group differences in ecological knowledge as one component of environmental literacy. *The Journal of Environmental Literacy*, *32*(4), 33-41.

Muijs, D. (2004). *Doing quantitative research in education with SPSS.* London: Sage Publications.

Muijs, D. (2011). *Doing quantitative research in education with SPSS* (2nd ed). London: Sage Publications.

Nardi, P. M. (2003). *Doing survey: A guide to quantitative research methods.* Boston, MA: Allyn and Bacon.

National Environmental Education Foundation. (2008). *Making connections: Annual report 2008.* Retrieved from earthcarecanada.com/Library/OCDSBreport09.pdf

Negev, M., Sagy, G., Garb,Y., Salzberg, A., & Tal, A. (2008). Evaluating the environmental literacy of Isreali elementary and high school students. *Journal of Environmental Education, 39*(2), 3-20.

North American Association for Environmental Education. (2000). *Environmental education materials: Guideline for excellence.* Washington: Author

Ontario EcoSchools. (n.d.a). *About Ontario EcoSchools.* Retrieved from http://ontarioecoschools.org/about_us/index.html

Ontario EcoSchools. (n.d.b). *About us: Aligning with ministry of education policy.* Retrieved from http://ontarioecoschools.org/about_us/alignment.html

Ontario EcoSchools. (2010). *Introduction to EcoSchools and the five-step process.* Retrieved from http://ontarioecoschools.org/program_guides/downloads/5-Step.pdf

Ontario EcoSchools. (2010). *2015-2016 Certification guide*. Retrieved from http://ontarioecoschools.org/become_an_ecoschool/downloads/Certification_Guide_2012-13.pdf

Ontario EcoSchools (2016). *Participating schoolboards.* Retrieved from http://www.ontarioecoschools.org/about-us/whos-involved/participating-school-boards/

Ontario Ministry of Education. (2010). *Growing success: Assessment, evaluation, and reporting in Ontario schools.* Author.

Ontario Ministry of Education. (n.d). Standards for environmental education in the curriculum. Author. Retrieved from http://www.edu.gov.on.ca/eng/teachers/enviroed/standards.html

Ontario Ministry of Education. (2009). *Acting today, shaping tomorrow – A policy framework for environmental education in Ontario schools.* Author.

Ottawa-Carlton District Board. (2010). *EarthCare™:* 2009*/2010 Year-End Report for the Ottawa-Carleton District School Board.* Retrieved fromhttp://earthcarecanada.com/Library/OCDSBreport09.pdf.

Orr, D. W. (1990). Environmental education and ecological literacy. *Education Digest, 55*(9), 53-58.

Orr, D. W. (1989). Ecological literacy. *Conservation Biology, 3*(4),. 334-335.

Overholt, E., & MacKenzie, A.H. (2005). Long-term stream monitoring programs in U.S.

secondary schools. *The Journal of Environmental Education, 36*(3), 51-56.

Pallas, A. M. (2001). Preparing education doctoral students for epistemological diversity. *Educational Researcher, 30*(5): 6–11.

Pinar, W.F. Reynolds, W.M., Slattery, P., &Taubman, P.M. (2000). Understanding curriculum. New York: Peter Lang

Parkay, F.W., Stanford, B.H., Vaillancourt, J. P., & Stephens, H. C. (2005). *Becoming a teacher.* Toronto, Canada: Pearson, Allyn and Bacon

Parsons, J., & Beauchamp, L. (2012). *From knowledge to action: Shaping the future of curriculum development in Alberta.* Alberta: Alberta Education. Retrieved from http://www.education.alberta.ca/media/6808607/knowledge_action.pdf

Pringle, J. (2010, November 16). Power Savings at Catholic School Board. 580 CFRA News Talk Radio. Retrieved from http://www.cfra.com/?cat=1&nid=76839

Puk, T. & Behm, D. (2003). The diluted curriculum: The role of government in developing ecological literacy as the first imperative in Ontario secondary schools. *Canadian Journal of Environmental Education, 8*, 217–236.

Raven, P. H., & Berg, L. R. (2001). *Environment* (5th ed). Danver, MA: John Willey.

Regional Roundup Group. (2006a). Go green initiatives take off in regional schools. *BioCycle, 47*(8), 13. Retrieved from Academic Search Complete database.

Regional Roundup Group. (2006b). High school gets LEED certification for green building standards. *BioCycle, 47*(2), 18.

Regional Roundup Group. (2006c). Student composting programs build on success of working models. *BioCycle, 47*(2), 18. Retrieved from Academic Search Complete database.

Regional Roundup Group. (2006d). What the future looks like for recycling in Wisconsin. *BioCycle, 47*(2), 18-19.

Roberts, N. S. (2008). Impacts of a national green corps program (Eco-Clubs) on students in Indian and their participation in environmental education activities. *Environmental Education Research, 15*(4), 443-464.

Roth, C. E. (1992). *Environmental Literacy: Its roots, evolution, and directions in the 1990s.* Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education. Retrieved from http://www.eric.ed.gov/PDFS/ED348235.pdf

Rovira, M. (2000). Environmental education programmes: Some issues and problems. *Environmental Education Research, 6*(2), 143-155.

Ruiz-Mallen, I., Barraza, L., Bodenhorn, B., & Reyes-Garcia, V. (2009). Evaluating the impact of an environmental education programme: An empirical study in Mexico. *Environmental Education Research, 15*(3), 371-387. doi:10.1080/13504620902906766.

Russell, C.L., Bell, A.C. & Fawcett, L. (2000). Navigating the waters of Canadian environmental education. In T. Goldstein & D. Selby (Eds). *Weaving connections: Educating for peace, social and environmental justice* (pp.196-217). Toronto: Sumach Press.

Sayers, J. (2007). The start of something big: Environmental education in china. *Green Teacher, 80*, 6-11.

Sharp, E., & Breunig, M. (2009). Sustaining environmental pedagogy in times of educational conservatism: A case study of integrated curriculum programs.

Environmental Education research, 15(3), 299-313. doi: 10.1080/13504620902807543

Shaw, J. (2003). Environmental education. *Society*, *41*(1), 60-66. Retrieved from Academic Search Complete database.

Shin, D., Chu, H., Lee, E., Ko, H., Lee, M., Kang, … & Park, J. (2005). An assessment of Korean students' environmental literacy. *Journal of Korean Earth science Society, 26*(4), 358-364.

Sitwala, I. (2014). Is there a conceptual difference between theoretical and conceptual frameworks? *Journal of Social Science, 38*(2), 185-195. Retrieved from http://www.krepublishers.com/02-Journals/JSS/JSS-38-0-000-14-Web/JSS-38-2-000-14-Abst-PDF/JSS-38-2-185-14-1396-Imenda-S-P/JSS-38-2-185-14-1396-Imenda-S-P-Tx[9].pmd.pdf

Smith, D. (2010, October 29). Halton's EcoSchool program thriving: Environmental program has grown from four to 99 schools since 2006. *InsideHalton.com*. Retrieved from http://www.insidehalton.com/community/environment/article/895799

Stapp, W.B. et al. (2005). The concept of environmental education. In H.R. Hungerford, W.J. Bluhm, T.L. Volk & J.M. Ramsey (Eds.), *Essential readings in environmental education*, 3ed. (pp. 33-36). Champaign, IL: Stipe.

State Education and Environment Roundtable (SEER). (2000). *California Student Assessment Project: The Effects of Environment-based Education on Student Achievement*. Retrieved from http://www.seer.org/pages/csap.pdf

Summers, M., Kruger, C., & Childs, A. (2001). Understanding the science of

environmental issues: Development of a subject knowledge guide for primary teacher education. *International Journal of Science Education, 23*(1), 33-53. doi:10.1080/09500690150198197.

Swanepoel, C. H., Loubser, C. P., & Chacko, C. P. C. (2002). Measuring the environmental literacy of teachers. *South African Journal of Education, 22*(4), 282-285.

Tanner, D. (2010). Analyzing wildlife habitat with Google Earth. *Green Teacher, 87,* 9-15.

Tree Canada. (n.d.). Future Generations: Greening Canada's School Grounds. Retrieved from http://www.treecanada.ca/site/resources/pages/files/1057_Greening_80217.pdf.pdf

Trewhella, W., Rodriguez-Clark, K., Corp, N., Entwistle, A, Garrett, S., … Sewall, B.J. (2005). Environmental education as a component of multidisciplinary conservation programs: Lesson from conservation initiatives for critically endangered fruit bats in the western Indian Ocean. *Conservation Biology, 19*(1), 75-85. doi: 10.1111/j.1523-1739.2005.2005.005488.x.

UNESCO. (1978). Final report: Intergovernmental Conference on Environmental Education, Tbilisi, USSR. 14-26 October. 1977. Connect. Paris: UNESCO/UNEP.

UNESCO-UNEP International Environmental Education Programme. (1983). Trends, needs and priorities in environmental education since the Tbilisi conference: An Overview (Preliminary report of a world survey). *Environmental Educational Series 1*, AUTHOR.

Unruh, G. G. & Unruh A. (1984). Curriculum development: Problems, processes, and progress. Berkley: McCutchan.

Uzun, V. F. & Keles, O. (2012). The effects of nature education project on the environmental awareness and behaviour. *Procedia – Social and Behavioral Science, 46,* 2912-2916. doi: 10.1016/j.sbspro.2012.05.588

Uzun, N. & Saglam, N. (2005). Effect of socio-economic status on environmental awareness and environmental academic success. *Hacettepe University Journal of Faculty of Education, 29*, 194-202.

Venkataraman, B. (2008). Why environmental education? *Environment, 50*(5) 8-10.

Volk, T., & McBeth, W. (1997). *Environmental literacy in the United States*. Washington, DC: North American Association for Environmental Education.

Volk, T.L. & McBeth, W. (2005). Environmental literacy in the United States. In H. R. Hungerford, W. J. Bluhm, T. L. Volk & J. M. Ramsey (Eds.), *Essential readings in environmental education,* (3ed., pp. 73-86). Champaign, IL: Stipe Publishing.

Walsh-Daneshmandi, A., & MacLachlan, M. (2006). Toward effective evaluation of environmental education: Validity of the children's environmental attitudes and knowledge scale using data from a sample of Irish adolescents. *Journal of Environmental Education*, *37*(2), 13-23. Retrieved from Academic Search Complete database.

Wang, S. (2009). The development of performance evaluation for green schools in Taiwan. *Applied Environmental Education and Communication, 8*(1), 49-58. doi:10.1080/15330150902953498

Wisconsin Center for Environmental Education. (1997). *Environmental education in Wisconsin, are we walking the talk? A profile of environmental education in Wisconsin K-12 schools based on statewide surveys and assessments of students,*

teachers, curriculum coordinators and principals. Stevens Point, WI: Author.

Woolfolk, A. E., Winne, P. H., & Perry N. E. (2004). *Educational psychology*, 2nd Canadian Edition. Toronto: Pearson.

Working Group on Environmental Education. (2007). *Shaping our schools, shaping our future: Environmental education in Ontario schools.* Report of the Working Group on Environmental Education. Ontario: Ontario Ministry of Education.

Zhenya, S. (2004). Establishment of "green schools" is an important medium in primary and secondary school environmental education. *Chinese Education and Society, 37*(3), 91-93.

Zhongguo, T. (2004). Establishing of "green schools" and enhancing teachers and students' environmental awareness. *Chinese Education and Society, 37*(3), 94-96.

Zsoka, A., Szerenyi, Z. M., Szechy, A., & Kocsis, T. (2013). Greening due to environmental education? Environemtnal knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and University students. *Journal of Cleaner Production 48,* 126-138. doi: 10.1016/jclepro.2012.11.030

APPENDIX A: MSELS

Middle School Environmental Literacy Survey

This Environmental Literacy Survey has several parts. Please read the directions for each part carefully. For each item, select what you think is the best answer for the item and then fill in the circle next to the letter of that answer on the response sheet. See the example below. Write only on your response sheet. Do not write your answers in this booklet or make any marks on its pages.

Example: Which one of these mammals can fly?

(a) elephant
(b) mouse
(c) bat
(d) dog

You would fill in the (c) circle on the response sheet: (a) (b) ● (d) (e)

I. About Yourself

1. Please darken in the letter on your response sheet that tells us how old you are.
   a) 11 years or younger
   b) 12 years
   c) 13 years
   d) 14 years
   e) 15 years or older

2. On your response sheet, darken in the square that indicates your grade.
   a) Six
   b) Seven
   c) Eight

3. On your response sheet, darken in the square that indicates your gender.
   a) Female
   b) Male

4. Please darken in the letter on your response sheet that identifies your Ethnic/Racial background.
   a) American Indian/Alaskan Native
   b) Asian/Pacific Islander
   c) Hispanic
   d) Black, Non-Hispanic
   e) White, Non-Hispanic

APPENDIX B: EcoSchools Questionnaire (Original)

DEMOGRAPHICS

Gender: M ____ F ____ Age: ____ Grade_____

Name of School _____ (Use the code supplied)

---

10. Have you ever been a member of any environmental organisation (including boys scout)? Yes _____ No _____

11. Name of the Organisation _____ How Long ____

12. Type of community you currently live (select as applied): _____Urban _____ Subuurban _____ Rural

ENVIRONMENTAL BACKGROUND

13. Favourite school subject_____

14. How many of the following courses have you taken?

Geography____ Environmental science ____ Sciences ____

LEVEL OF PARTICIPATION IN AN ENVIRONMENTAL EDUCATION PROGRAM

15. Have you ever participated in any environmental program in your schools? Yes____No____ Name of program____

16. If yes to the above question, how often have you participated?

(a) Rarely___(b) A couple of times a term___(c) 1-2 times a month (d) Lots of times (once every week)

SOURCE OF ENVIRONMENTAL KNOWLEDGE

17. To what extent do you get your knowledge of the environment from the following sources?

	~~To a Great Extent~~	~~To A Large Extent~~	~~To A Moderate Extent~~	~~To a Some Extent~~	~~To No Extent~~
~~Television~~					
~~School (Specify Subject)~~					

Books					
Web/Internet					
Church					
Environmental Club					
Friends					
EcoSchools					

ECOSCHOOLS QUESTIONS

1. Match each of the appliance cards to the wattage card which BEST represent its energy use.

				Energy Use (EcoSchools Material)
 Computer	500 Watts	60 Watts	150/30 Watts	
 Microwave	350 Watts	600 Watts	900 Watts	
 Game Console	5 Watts	21 Watts	150 Watts	
 Lap top	100 Watts	50 Watts	150 Watts	
 Dish Washer	500 Watts	2000 Watts	1500 Watts	

2. List 5 ways energy can be conserved in your school
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____
3. Do you see stickers in your classroom telling you to turn off the lights? Yes ___ No ___
4. Approximately how many of your classrooms? None____ Few ____ Some ____Most ____ All____
5. Have you seen any GOOS paper system in any of your classrooms, computer rooms or library? ___ I don't Know ___
6. Approximately how many rooms? _____ I don't Know ___
7. Does your school recycle batteries? ____ I don't Know ___

8. What colour of recycle box are you supposed to put the papers? _____ I don't Know ___
9. What colour of bin are you supposed to throw the ~~thrash~~?
10. Do you have compost in your school? Yes ____ No ____ I don't Know ____
11. Is your school one of the EcoSchools? Yes____ No____ I am not Sure_____
12. If you answered yes to the question above, how do you know that your school is an EcoSchools?

    _____

    _____

    _____
13. Have you ever heard your any of your teachers talk about the EcoSchools? Yes____ No _____

~~14. Instructions~~

~~Below are questions pertaining to your experiences, circle the one that best describes your experience. Interpret your scale values as follows:~~

~~1 = to no extent (hardly)~~
~~2 = to a some extent (once a year)~~
~~3 = to a moderate extent (1-3 times in 6 months)~~
~~4 = to a considerable extent (1-2 times a month)~~
~~5 = to a great extent (once a week)~~

~~To what extent do you recall having the following kinds of experiences?~~

~~a.~~	~~Spending time alone in nature~~	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~
~~b.~~	~~Spending time with only one or two people in nature~~	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~
~~c.~~	~~Witnessing the destruction of a natural area~~	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~
~~d.~~	~~Having your parents, grandparents or guardians encourage you to care for the environment~~	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~
~~e.~~	~~Having your teacher encourage you to care for the environment~~	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~
~~f.~~	~~Having other people encourage you to care for the environment~~	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~
~~g.~~	~~Watching films with an environmental message~~	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~
~~h.~~	~~Watching television shows or specials with an environmental message~~	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~
~~i.~~	~~Reading books with an environmental message~~	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~
~~j.~~	~~Reading magazines with an environmental message~~	~~1~~	~~2~~	~~3~~	~~4~~	~~5~~

~~(Adapted from Marcinkowski, 1997).~~

APPENDIX C: EcoSchools Questionnaire

DEMOGRAPHICS

Gender: M ____ F ____ Age: ____ Grade_____ Name of School _____

1. Have you ever been a member of any environmental group, or clubs (including boys scout)? Yes __ No _
2. If yes to question 1 above, what is the name of the organisation? _____ For how long? _____
3. What type of community do you currently reside (select as applied): Urban __ Suburban ___ Rural____

ENVIRONMENTAL BACKGROUND

4. What is your favourite school subject? _____
5. How many of the following courses below have you taken in high school? Geography____ Environmental science ____ Sciences ____

LEVEL OF PARTICIPATION IN AN ENVIRONMENTAL EDUCATION PROGRAM

6. Have you ever participated or currently participate in any environmental program/club in your schools? Yes____No____
7. If yes to question 6 above, name the program/club _____
8. How often do you participate (d) in this program or club?
   (a) Rarely (b) A couple of times a semester (c) 1-2 times a month (d) Lots of times – once every week (e) Never

SOURCE OF ENVIRONMENTAL KNOWLEDGE

9. To what extent do you get your knowledge of the environment from the following sources (check all the appropriate boxes?

SOURCE	**Great Extent**	**Large Extent**	**Moderate Extent**	**Some Extent**	**No Extent**
Television (specify program)					
School (subject?)					
EcoSchools club					
Books					
Web/Internet					
Environmental Club (specify name)					
Friends					
Others (specify name)					

ECOSCHOOLS QUESTIONS

10. Do you see stickers in your classroom telling you to turn off the lights?
    Yes _____ No _____
11. Approximately how many of your classrooms do you see these stickers?
    None____Few ___ Some ___Most ___ All___
12. Have you seen any GOOS (good on one side) paper system in any of your classrooms, computer rooms or library? ___ I don't Know ____
13. Approximately how many rooms have you seen GOOS paper?
    None____ Few ____ Some ____Most ____ All____
14. Does your school recycle batteries? Yes____ No____ I don't Know ____
15. What colour of recycle box are you supposed to put papers? _____ I don't Know _____
16. What colour of recycle box are you supposed to put bottles and cans? _____
    I don't Know _____
17. What colour of bin do you throw in the garbage? _____
    I don't know _____
18. Is your school one of the EcoSchools? Yes____ No____
    I am not Sure_____
19. If you answered yes to question 17 above, what is your school's level of certification? _____ I don't know_____
20. If you answered yes to question 17 above, how do you know that your school is an EcoSchools? _____
21. Have you ever heard any of your teachers talk about the EcoSchools program?
    Yes____ No ____
22. In your own opinion, what do you think of the EcoSchools program is?
    _____
23. Which subject teacher/s talk(s) about the EcoSchools program?
    _____
24. What are your general thoughts about the EcoSchools program?
    _____
    _____
    _____
25. List 5 ways energy can be conserved in your school
    a. _____
    b. _____
    c. _____
    d. _____
    e. _____

APPENDIX D: EcoSchools Teachers Interview Questions (Original)

1. What subject do you teach?
2. How long have you been teaching?
3. How many EcoSchools teacher representative are there in this school?
4. Can you briefly highlight what you do as the schools EcoSchools facilitator
5. Do you have an Eco or Environmental club?
6. Are you a member of the club?
7. How often does the cub meet?
8. Do you have an Eco/Environmental board where you put information related to the environmental?
9. Do you think the EcoSchools program is a good idea? Why or why not?
10. On a scale of 1-5, how committed are you to the EcoSchools program. 1 = not very committed and 5 = extremely committed. Why?
11. In your opinion, what changes has the EcoSchools program brought to your school?
12. How well do the teachers embrace this program?
13. What needs to change (if any) to make the EcoSchools program more effective?
14. In your own opinion, is the EcoSchools program meeting its goals?
15. Have you had any training or PD relating to the EcoSchools program?
16. If not, do you think it is necessary? Why or why not?
17. Have you used materials from the EcoSchools program for teaching in your classroom?
18. Do you encourage your student to participate in the EcoSchools program? How?
19. What aspect of the EcoSchools program do you find most impressive/useful/relevant.
20. Which aspect do you find irrelevant?
21. ~~Is there any board constraint limiting your effectiveness?~~

APPENDIX E: EcoSchools Teachers Interview Questions

ECOSCHOOLS FACILITATOR INTERVIEW QUESTIONS

1. What subject do you teach? _____
2. How long have you been teaching? _____
3. How many EcoSchools teacher representative are there in this school? _____
4. Can you briefly highlight what you do as the schools EcoSchools facilitator

   _____

   _____

   _____
5. Does your school have an Eco or Environmental club? _____
6. Are you a member of the club? _____
7. How often does the club meet? _____
8. What do you do in the club? _____

   _____

   _____

   _____
9. What is the grade/age range of the students in the club? _____
10. Do you have an Eco/Environmental board where you put information related to the environmental in the school? _____

    _____

    _____
11. Do you think the EcoSchools program is a good idea? Why or why not? _____

    _____

    _____
12. On a scale of 1-5, how committed are you to the EcoSchools program. 1 = not very committed and 5 = extremely committed. _____
    Why? _____

    _____

    _____
13. Do you encourage your students to participate in the EcoSchools program? _____
    How? _____

_____

_____

14. In your opinion, what changes has the EcoSchools program brought to your school?

_____

_____

_____

15. How well do (o)the(r) teachers embrace this program? _____

_____

16. What needs to change (if any) to make the EcoSchools program more effective?

_____

_____

_____

17. How do you pass along the core teachings of the EcoSchools to other member of the school community (e.g. other teachers and students not in the eco-club? _____

_____

_____

_____

18. In your own opinion, is the EcoSchools program meeting its goals? _____

_____

_____

19. Have you had any training or PD relating to the EcoSchools program? _____
20. If not, do you think it is necessary? Why or why not? _____

_____

_____

21. Are you aware of the curriculum related materials available at the EcoSchools website? _____
22. Have you used materials from the EcoSchools program for teaching in your classroom? _____
23. If no, why? If yes, were the materials relevant? _____

_____

_____

24. What aspect of the EcoSchools program do you find most impressive/useful/relevant? _____

_____

25. Which aspect do you find irrelevant? _____

_____

_____

26. Do you believe the EcoSchools have promoted or improved environmental literacy among students (how)?

_____

_____

_____

27. Any suggestions, thoughts, advise on environmental literacy testing, environmental education in secondary schools and/or the EcoSchools program? _____

_____

_____

APPENDIX F: EcoSchools Board Co-ordinator Interview Questions

1. The EcoSchools program is tied to the Ontario curriculum. Do you have any assessment/yardstick to gauge how much the students are gaining from the rich EcoSchools resources?
2. Do you send teachers to go view the resources available to them?
3. Who is the steering committee?
4. From your own point of view, would you say the elementary or the secondary school has had more success in weaving ecological literacy into the curriculum? Why?
5. What is the nature of the workshops you hold for the eco-team?
6. Are the training workshops mandatory or voluntary?
7. Is there any information you would like me to find out from the students and the teachers concerning the EcoSchools program that can further help to strengthen it?
8. Is there any monetary support for schools embarking on schoolyard greening other than the $500 incentive for certification?
9. Do you have any preference for a particular subject teacher being the eco-team leader?
10. Are all the schools in the board certified?
11. Any platinum certified school in the board?
12. Can you estimate the savings the board enjoys as a result of the EcoSchools program?

APPENDIX G: School Walk-Around Checklist and Observation Sheet

School Code:

1	School ground/greening	1	2	3	4	5
2	Eco-board …	Exist		N. Existing		
3	Eco-board Aesthetics	1	2	3	4	5
4	Eco-board Materials	1	2	3	4	5
5	EcoSchools Boards and Awareness Posters	1	2	3	4	5
6	Recycle Separation	1	2	3	4	5
7	Visible Cues Encouraging Good Environmental Practice	1	2	3	4	5

APPENDIX H: Key for School Walk-Around Checklist and Observation Sheet

1. School ground/greening	1 = needs work 5 = Very green/conscious/deliberate greening efforts
2. Eco-board	1 = Existing 2= non-existing
3. Eco-board Aesthetics	1 = Dull/Not Noticeable 5 = Eye Catching/visible from afar
4. Eco-board Materials	1= Outdated 5 = Current/relevant
5. EcoSchools Bins and Awareness Posters	1 = Needs more exposure 5 = Obvious/enough
6. Recycle Separation	1 = Materials are just dumped 5 = Perfect Separation
7. Visible Cues Encouraging Good Environmental Practice	1 = Does not exist 5 = Can be found all over

APPENDIX I: SPSS Code Sheet for EcoSchools Questionnaire

S/N	PARAMETER	ITEMS	CODE
1	**STUDENT #**	#	#
2	**SCHOOL**	SCHOOL A	1
		SCHOOL B	2
		SCHOOL C	3
		SCHOOL D	4
		SCHOOL E	5
		SCHOOL F	6
		SCHOOL G	7
		SCHOOL H	8
		SCHOOL I	9
		SCHOOL J	10
		EcoSchools Club (In School F)	11
		Neighbourhood Teen Organization	12
		Independents	13
3	**ECOSCHOOL STATUS (Y/N)**	Yes	1
		No	2
4	**KNOWLEDGE OF ECOSCH STATUS**	Yes	1
		No	2
5	**REASON INFORMING KNOWLEDGE OF ECOSCHOOL STATUS**	Yes	1
		No	2
6	**ECOSCHOOLS LEVEL OF CERFICATION**	Gold	1
		Silver	2
		Bronze	3
		Non-EcoSchools	0
7	**KNOWLEDGE OF ECOSCHOOLS LEVEL OF CERTIFICATION**	Yes	1
		No	2
8	**SURVEY STATUS (C/I)**	Complete	1
		Incomplete	2
9	**SCHOOL LOCATION (Urban/County)**	Urban/City School	1
		County School	2
10	**GENDER (M/F)**	Male	1
		Female	2
11	**ETHNICITY**	Native Canadian	1

		Asian/Pacific Islander	2
		Hispanic	3
		Black, Non-Hispanic	4
		White, Non-Hispanic	5
		Mixed	6
12	**AGE**	13 and Below	1
		14	2
		15	3
		16	4
		17	5
		18 and above	6
13	**GRADE**	Grade 7 & 8	1
		Grade 9	2
		Grade 10	3
		Grade 11	4
		Grade 12	5
		Grade 13	6
14	**NUMBER OF ENVIRONMENTAL RELATED COURSE TAKEN**	#	#
15	**COMMUNITY OF RESIDENCE**	Urban	1
		Suburban	2
		Rural	3
16	**MEMBER OF AN ECOCLUB?**	Yes	1
		No	2
17	**NUMBER OF YEARS MEMBER OF AN ENVIRONMENTAL CLUB**	0-6 months	1
		6months - 1 Year	2
		More than 1 Year	3
18	**FAVOURITE SCHOOL SUB**	Science	1
		Math	2
		Physical Education	3
		Social Science/Humanities/Business	4
		Technology	5
		Arts	6
		Languages	7
19	**SOURCE OF ENVIRONMENTAL KNOWLEDGE (SOEK)**	**Television 1 (4-0)**	SOEK1
		Great Extent	4

		Large Extent	3
		Moderate Extent	2
		Some Extent	1
		No Extent	0
		School Subjects 2 (4-0)	#
		Great Extent	4
		Large Extent	3
		Moderate Extent	2
		Some Extent	1
		No Extent	0
		EcoSchools Club 3 (4-0)	#
		Great Extent	4
		Large Extent	3
		Moderate Extent	2
		Some Extent	1
		No Extent	0
		Books 4 (4-0)	#
		Great Extent	4
		Large Extent	3
		Moderate Extent	2
		Some Extent	1
		No Extent	0
		Web/Internet 5 (4-0)	#
		Great Extent	4
		Large Extent	3
		Moderate Extent	2
		Some Extent	1
		No Extent	0
		Friends 6 (4-0)	#
		Great Extent	4
		Large Extent	3
		Moderate Extent	2
		Some Extent	1
		No Extent	0
		Others 7 (4-0)	#
		Great Extent	4
		Large Extent	3

		Moderate Extent	2
		Some Extent	1
		No Extent	0
20	**LEVEL OF PARTICIPATION IN AN ENVIRONMENTAL CLUB**	Rarely/Never	1
		A couple of times a semester	2
		2x a month/biweekly	3
		Lots of times	4
21	**ECOSCHOOLS QUESTION SCORE**	Q 10 - N	#
	Awareness and Noticeability	Q 11 - N	#
		Q 12 - N	#
		Q 13 - N	#
		Q 14 - N	#
		Q 15 - A	#
		Q 16 - A	#
		Q 17 - A	#
		Q 18 - A	#
		Q 19 - A	#
		Q 20 - A	#
		Q 21 - N	#
		Q 22 - A	#
		Q 23 - N	#
		Q 24 - A	#
		Q 25 - A	#
22	**ENVIRONMENTAL THOUGHTS**	#	#
23	**ENVIRONMENTAL ACTIONS**	#	#
24	**ENVIRONMENTAL SENSITIVITY**	#	#
25	**ENVIRONMENTAL FEELING**	#	#
26	**ENVIRONMENTAL ISSUE ANALYSIS**	#	#
27	**ENVIRONMENTAL LITERACY TOTAL**	#	#
28	**LEVEL OF ENV LITERACY**	Level 1 – 50-59	1
		Level 2 – 60-69	2
		Level 3 – 70-79	3
		Level 4 – ≥80	4
29	**ROTH'S ENVIRONMENTAL LITEACY CONTINUUMS**	< 50% - Approaching Nominal Literacy (ANL)	1
		50-59% - Nominally Literate (NL)	2

		60-69% - Approaching Functional Literacy (AFL)	3
		70-74% - Functionally Literate (FL)	4
		75-79% - Approaching Operational Literacy (AOP)	5
		≥80% - Operationally Literate (OP)	6

APPENDIX J: Copyright Permission for the Use of MSELS

Center for Instruction, Staff Development and Evaluation
1925 New Era Road
Carbondale, IL 62901

cisde@midwest.net

PH: 618-457-8927 *Fax: 618-351-6120*

January 22, 2014

Windsor ON N9G 2Z4

Dear Blessing:

This letter constitutes permission for you to use the Middle School Environmental Literacy Survey in your doctoral study. Please cite the instrument in the following manner: Hungerford, H.R., Volk, T.L., McBeth, W.C., & Bluhm, W.J. (2009). *Middle School Environmental Literacy Survey*. Carbondale, IL: Center for Instruction, Staff Development, and Evaluation.

I understand that your study will investigate the environmental literacy of Ontario students (grades 9 - 12) students who attend EcoSchools as compared to their counterparts in schools not participating in the EcoSchools program. You have indicated that you will restrict access to the MSELS to those who are involved in the study or otherwise closely associated with your study. Thank you for that consideration. We prefer that you not include a copy of the instrument in any report. Rather, please indicate that the instrument cannot be distributed or used without permission from the Center for Instruction, Staff Development and Evaluation (CISDE), and provide the contact information contained in our letterhead (land address, telephone and email address).

We wish you continuing success as you carry out your study. Please do not hesitate to contact us if you have questions, or if there is some other way that we may be of help. We look forward to receiving a copy of your research report.

Sincerely,

Dr. Trudi Volk, Executive Director
Center for Instruction, Staff Development and Evaluation

APPENDIX K: Parental Consent Form

PARENTAL INFORMATION/CONSENT TO PARTICIPATE IN RESEARCH

Faculty of Education
University of Windsor
401 Sunset Avenue
Windsor, Ontario N9B 3P4
(519) 96*-99**

October, 2014

Dear Parent/Guardian,

Parental Consent Form: Environmental Literacy Assessment Survey

I am a Ph.D. candidate at the Faculty of Education, University of Windsor. I am conducting an environmental literacy survey among high school students to measure environmental literacy as an outcome of the EcoSchools program. I would like your child/ward to participate in this survey. Their participation entitles them to a class draw for a $20 mall gift certificate.

The survey is confidential and no personal identifying information is collected. You and your child can withdraw at any time from this study. There is no risk for participating in this research. If you have any questions or concerns about the research, please feel free to contact Blessing Igbokwe, 519 96*-99** or Dr. Geri Salinitri (Dissertation Supervisor), 519-253-3000 ext. 3***.

Blessing Igbokwe

Investigator

……
Your signature indicates your permission to allow your child to participate in the survey

_____ _____

Parent/Guardian signature Date

APPENDIX L: Test of Normality

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
ENV. KNOWLEDGE (25%)	.165	584	.000	.888	584	.000
ENV. AFFECTS (25%)	.043	584	.013	.994	584	.024
ENV. RES. BEHAVIOUR (25%)	.054	584	.000	.989	584	.000
ENV. SKILLS (25%)	.082	584	.000	.970	584	.000
EL TOTAL (%)	.037	584	.053	.993	584	.009

a. Lilliefors Significance Correction

Middle School Environmental Literacy Survey

(Hungerford, Volk, McBeth, and Bluhm, 2006, 2009)

MSELS Survey Administration and Scoring Protocol

**Center for Instruction, Staff Development and Evalnation (CISDE),
1925 New Era Road, Carbondale, IL 62901, 618-457-8927, cisde@midwest.net**

SURVEY ADMINISTRATION PROTOCOL
(Student answers directly in booklets)

Teacher Introduction of the Data Collector to Class

Today we'll be participating in a survey. I'd like you to give your full attention to the person who'll be handing out questionnaires. This is Mr./Ms. _____, who will be working with us today.

When you're completing the questions, it's important that you give answers that show how you feel, what you think, or what you do. All answers will be kept strictly confidential. You're not going to put your name on the booklet, so nobody, not even I, will know what answers you gave. And your answers will not affect your grade in any way. When you finish, you will put your booklet, with no name on it, into a box where it will be mixed together with all of the other booklets. Some of the questions call for correct answers, but many ask about you, so please be completely honest. If there is a question that you feel you cannot answer honestly, please leave it blank.

If you have any questions, please ask the person giving out the questionnaire.

Data Collector Script

Hello, my name is _____. I'm conducting a very important survey with kids your age across the United States.

I'm going to give everyone in the class one of these booklets (**HOLD UP A SURVEY [the Middle School Environmental Literacy Survey]**). It has questions in it that you're going to be answering to help us find out what you think about the environment. The instructions refer to a separate response sheet, but we won't be using that. Instead, you should just circle the correct answer in your booklet. We will be using pencils, so if you change your mind about a question and want to answer differently, please be sure that you completely erase your first answer.

DO NOT put your name on the booklet. We want your answers to be private. When you're done filling out the booklet, close it and put it in this box. (**HOLD UP THE CLASSROOM BOX**). All of this should take about 45 to 50 minutes at the most.

When you're filling out the booklet, if a question asks about something you don't know about, just don't answer that question. If you have questions about the instructions, please raise your hand and I will come and talk with you. I'm going to hand out the questionnaire booklets now. I want to talk with you about them a little, so please do not begin until I say you should.

(continued)

(**Distribute the MSELS Booklets**)
Before you begin, I'd like to call your attention to the different ways you will be asked to answer the questions. All of the questions except one are a type of multiple choice. See the example on the front of the booklet. There is one answer for a, one for b, one for c, and so on. In all cases, you are to circle the answer that you think is best, or the one that best describes how you think or feel. Sometimes the answers are in a list, like the example on the front of the booklet. Sometimes the answers are spread out in a line, like those on page 5. (**Pause so the students can turn to page** 5).

The very last page is different from either of those two ways. You will probably be a little tired when you get to that last page, so please take your time and read the instructions carefully. The task on that page is an important one and we do want to know what you think about it. Let's take a minute and look at the last page. The directions in the box tell you that there are eight different choices you have. Those choices are listed below the box as # 68, # 69, and so on, all the way to #75. For the last task you are asked to read through all those eight choices and select two answers that you think are the best. You will circle those two answers. All of the other answers will be left unmarked. Does everyone understand how this page is different from all the other pages? You will circle the two best answers for this question, and leave the rest unmarked.

All right, then. You may begin.

APPENDIX N: Amendments to MSELS Survey

These are the alternatives for questions 1, 2 and 4 options in the MSELS booklet.

- Question 1:
  - a) 14 years or younger
  - b) 15 years
  - c) 16 years
  - d) 17 years
  - e) 18 years or older
- Question 2:
  - a) nine
  - b) ten
  - c) eleven
  - d) twelve
- Question 4:
  - a) Native Canadian

NOTE: Write down your responses to the EcoSchools Questionnaire on the survey paper.

VITA AUCTORIS

NAME:	Blessing A. Igbokwe
PLACE OF BIRTH:	Ilorin, Kwara
YEAR OF BIRTH:	1973
EDUCATION:	University of Ilorin Secondary School, Ilorin, Kwara, 1991 University of Lagos, B.Sc./Ed, University of Lagos, Lagos, 1999 University of Windsor, M.Sc., University of Windsor, Windsor, ON, 2005 University of Windsor, B.Ed., University of Windsor, Windsor, ON, 2006 University of Windsor, Ph.D., University of Windsor, Windsor, ON, 2016